GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXV., No. 3298.] WEDNESDAY, AUGUST 4, 1926. [78TH YEAR.

EDITORIAL NOTES.

Amending Orders and the Increased Cost of Coal.

THOSE gas undertakings which are applying for Amending Orders under the Gas Regulation Act, owing to the increased cost of coal in consequence of the coal stoppage, will have studied the rules for making application which were published in the "JOURNAL" last week. Supplementing the information then promulgated, an article appears on a later page of this issue which contains suggestions from the Board of Trade, and gives guiding information as to their intentions in this relation. All applicants for an Amending Order should not fail to read the additional particulars, in conjunction with the rules published last week.

High-Grade Gas from Verticals.

IN this issue is published a review of Technical Paper No. 15, issued by the Fuel Research Board. It deals with the results of some experiments at the Fuel Research Station, in the Glover-West vertical retorts, on the production of coal gas of high calorific value from "Holmside" (Durham) coal. The experiments were also carried further to show the effect of adding increasing percentages of steam to the charge. This is an example of the extremely valuable work which is being done by the Board. Already, we have had a full treatment of a number of coals, particularly from the Lancashire coalfield, in which the whole gamut of information is traversed—an examination of the coal in the seam, laboratory analyses, low-temperature assay, and finally the results obtained in carbonizing plant on full gas-works' scale, making gas over the whole range of calorific values practically saleable in this country. This is a great work; and its completion would place in the hands of the gas industry, and all other fuel-using industries, the means of evaluating and making the best use of our coal resources, the need of which is recognized on all hands.

A critical examination of the latest paper (referred to in the opening lines of this article) suggests some points to which attention may be directed. In the first place, we doubt whether regular users of Holmside coal would agree that this is correctly placed in the second class. Next, it may be questioned whether regular operators of Glover-West vertical retorts carbonizing Durham coals would agree that the alterations made in the adjustments of the Fuel Research Station plant, though they did in this case improve the yield of gas, were such as would be expected to give the maximum results. As a matter of fact, previously published information goes to show that the results obtained are not as high as have been realized by other methods. It must be remembered that the production of high calorific value gas in continuous vertical retorts is no new thing. Confining ourselves to the Glover-West system (as that is the one used at the station) we find that Dr. H. G. Colman, in 1909, obtained 13,102 c.ft. of 573 B.Th.U. gas per ton of Thornley coal, and 12,740 c.ft. of 573 B.Th.U. gas with Londonderry coal; while in the "JOURNAL" in 1919 (Vol. 147, p. 665) we published results obtained at the Mariendorf Gas-Works, showing 13,520 c.ft. of 553 B.Th.U. gas with Lambton coals. It appears to us that the working temperatures in the experiments were lower than is usual in practice. In most retort-houses, 1300° C. is considered a safe working temperature with moden refractories; whereas the Fuel Research Station seems to prefer to keep below 1200° C. It may be that experts would say that some of the other adjustments are open to question.

Valuable, therefore, as is the information given in the paper, it may be suggested that the figures should not be looked upon as a standard by which should be judged the results actually obtainable in the production of high calorific value gas in continuous vertical retorts.

Helps v. Oldham Corporation.—The Judgment.

AN action which has aroused great interest in the gas industry has just come to an end by the delivery of judgment by Mr. Justice Lawrence, based upon evidence laid before him at sittings which, in the aggregate, occupied some three weeks, with a further period for the study and consideration by his Lordship of the arguments and evidence. The case is that of *Helps v. the Oldham Corporation;* and the judgment pronounces completely for the claim and counterclaim of the Corporation, with costs. No complaint can be made by either side that a thorough investigation was not made. As a matter of fact, from an outside observer's point of view, having regard to the nature of much of the evidence given, there might have been considerable compression without detriment to either side. For Mr. Helps, the outcome is a serious one—assuming the case is not carried further, and a reversal of the decision be obtained—from the point of view of financial loss, and from that of the work to which he has devoted a large part of his professional life—whether rightly or wrongly is not a matter for present discussion. There is, however, little doubt that the action will not do anything to damp his ardour as an advocate of gas of low grade in respect of constitution, and of low value in respect of thermal property per c.ft.

What Mr. Helps sought in this case was an account from the Oldham Corporation of royalties due to him for the use of his invention for the manufacture of low-grade gas, or, in the alternative, damages for alleged breach of contract, and an injunction restraining the Corporation from using his ideas and inventions at any but their Higginshaw Works. The Corporation counterclaimed for damages for an alleged breach of an agreement, under which Mr. Helps guaranteed (they submitted) that the plant at the Higginshaw Works would yield a minimum of 15 million B.Th.U. per ton of coal used. The judgment is given in our "Legal Intelligence," and it epitomizes the facts without going into detail. A salient remark in the judgment is: All the plaintiff had guaranteed was that the plant would yield 20 million B.Th.U. per ton of coal; and if it did not yield 15 million B.Th.U., he would pay the Corporation one-quarter of the amount expended on the plant by way of liquidated damages. In his Lordship's opinion, the "Pleno" plant at Higginshaw was badly designed, and industrially impracticable when coal was used as the producing fuel. Discussing the point as to whether Mr. Helps was entitled to royalties, his Lordship said that, treating the licence as confined to the use of the "Pleno" plant, and paying no attention to the fact that the plant was not the subject of letters patent, it had been clearly proved that the Corporation had never installed, or adopted, the plant at any other of their

works within the meaning of clause 3 of the agreement. In addition, they had never decided to adopt the invention. In these circumstances, no royalties were in his judgment payable in respect of the use of the plant at Higginshaw. The Corporation, not being able to obtain from the plant the guaranteed minimum of 15 million B.Th.U. per ton of coal used, were not liable for the payment of royalties, nor had there been on their part any wrong or illegal use of information of a confidential nature, such as entitled Mr. Helps to damages. It was further the view of his Lordship that Mr. Helps had not disclosed to the Corporation anything which in 1918—the year of the agreement—was a useful contribution to the knowledge of the gas industry.

Thus it was his Lordship came to the conclusion that the Corporation were entitled to succeed on their counter-claim for a quarter of the amount expended on the plant, which means that judgment was entered for them for the sum of £4257 19s. 3d., with costs, which it is clear, in view of the protracted nature of the case, will amount to a considerable sum.

A Break in Obstinacy.

There has been a break in the obstinacy of the Executive of the Miners' Federation; but, when the new position is properly explored, it is found that there is not much in it, although it makes a fresh point from which to regard matters. The best that can be said for it is that it shows there is a weakening of the costly attitude hitherto adopted by the Federation Executive. There is new blood in that body, through automatic retirement and new election; but we do not think that this fact has had much influence, as the newcomers form a small part of the total. It would be a good thing if several others of the old Executive could be sent into other spheres where they could not do such unbounded mischief not only to the coal-mining industry, but to the country at large, and to the workers in other industries.

However, Messrs. Smith, Cook, and Co. have had to climb down from the pedestal upon which they had perched themselves; and they have had to give way on one of the vital points in their slogan, with the view of obtaining an opening for a revival of negotiations. The Executive last Thursday re-affirmed their acceptance of what is called "the Bishops' formula;" and, after an exciting debate and not a small amount of opposition, the delegates' conference on Friday also endorsed it. Now a ballot of the districts is to be immediately taken, with a recommendation of acceptance attached. Votes are returnable on Saturday; and, in view of the recommendation, there is little doubt as to the result being compliance. The Executive know that the time has come when they must do something. Warwickshire and Cannock Chase are ill omens for them, notwithstanding the mission sent to America with the view of collecting funds for protracting the stoppage here. We are not inclined to think that America will do much in the way of subscribing funds to the British miners; and perhaps the miners' leaders themselves have misgivings. Their experience of Europe is that, however generous their fellows in other countries are on the first appeal, the generosity is short-lived, and what is done does not go far among a million miners. But to the Bishops' formula, which is the important thing at the moment. We have not previously published it in the "Journal," and this is an opportune time. Its items are as follows:

1. Immediate resumption of work on conditions obtaining on April 30, 1926, including hours and wages. The settlement, when arrived at, shall be on the basis of a national agreement.
2. A national settlement to be reached within a short defined period, not exceeding four months. In order to carry through clause 1, financial assistance to be granted by the Government during the defined period under a scheme to be drawn up by the Commissioners who prepared the report. The Commissioners shall be reappointed for this and for the other purposes mentioned in the following clauses.
3. The terms of the reorganization scheme and the reference to wages in the report to be worked out in detail by the Commissioners, and the results to be incorporated by them, as far as may be necessary, in a Parliamentary Bill or Bills.
4. Those parts of the reorganization scheme capable of early application to be put into operation at the earliest moment practicable.
5. The Government to give assurance that those parts of the report which require legislative sanction shall be placed on the Statute Book at the earliest possible moment.
6. At the end of the defined period, if disagreements should still exist, a joint board, consisting of representatives of both parties, shall appoint an independent chairman whose award in settlement of these disagreements shall be accepted by both parties.

When previously placed before him, the formula was rejected by the Prime Minister, on behalf of the Government, in view of the fact that it involves a further subsidy.

What adoption by the miners' delegates, in the first place, means is that they have given way on wages, and are prepared to go to arbitration—on their own terms. Hours are to be regarded as inviolable. Some time ago the Prime Minister suggested arbitration; but the Executive would not consider it. They will do so now; but only on wages—not on the pre-war scale, but on the figures that will rule at least two months after the miners resume work. The craftiness of the condition is too obvious to find acceptance. During the two months following resumption of work, there will be fine markets for coal in the scramble to replenish stocks for next winter. In short, what the Federation Executive are after is arbitration on abnormal conditions, and not on what, in the new economic circumstances, are the normal figures. The coal industry could no more afford subsequently to pay wages on such a basis than it could before the war. Directly the boom is over, fundamental economic conditions will again assert themselves, and with increased intensity, seeing that so many coal contracts for delivery abroad have been lost. Another thing is that the arbitration proposed is not one with independent members; but between the two parties, with an independent chairman. This condition, with the basic post-strike period which it is suggested shall apply to the arbitration, makes the whole thing ridiculously hopeless. The seven-hour day, with its reduced output per man-shift, and more men employed to compensate the output loss, are the chief contributors to the parlous state of the industry.

There is little chance of the proposals being accepted—particularly with a four months' subsidy attached. After running the country into an expenditure and loss representing, in round figures, 200 millions sterling, it is gross impertinence on the part of the Miners' Executive to expect that the taxpayers, including the other industries of the country and the workers in them, will consent to a further subsidy for the miners. If the Government had the temerity to propose such a thing, we believe the whole country would rise in rebellion against them. The mischief makers have already done incalculable harm to the country. But we have the Premier's assurance that the Government will not budge from their resolve not to grant more subsidy. We have not the slightest doubt that the Miners' Executive have asked for more than they expect to get; but now that they have made this fresh move, we must recognize that it will probably deter further men returning to work on the eight-hour basis, until they see what is going to happen. The conditions cannot be entertained—even though there would be an immediate return to work. To accept them would worsen the future state of the coal industry, the country, and all the other industrial workers in it.

The Chemist in Industry.

The great congress of chemists (organized by the Society of Chemical Industry and the Institution of Chemical Engineers), which has recently been held in London, has been of good public service. All too long—much like the gas industry formerly—our chemical friends have lived conservative lives, as though interest in their doings was confined to their own profession and their own industries. They have discovered their mistake; they have found that publicity pays—not perhaps in direct coin, but in the interest which is engendered in their work, and which develops an atmosphere that will, we venture to think, be of incalculable value in broadening the scope for all

engaged professionally in chemistry—to their advantage and that of the country generally. Besides publicity, as Mr. W. J. U. Woolcock, C.B.E., the retiring President of the Society of Chemical Industry, pointed out, the policy of co-operation with allied societies is being pursued. That again is important. Chemistry for its fullest development, and for the provision of scope, wants other industries within which to exercise its valuable functions; and other industries will court the aid of chemistry the more the governors of those industries can be drawn from the beaten paths, and be persuaded that chemical science is a helpmate in progress which cannot, and must not, now be ignored.

During the week of the Congress, there was much said which is logically and philosophically sound—which shows how science and industry are definitely bound together, if maximum progress and results are to be secured, and we are not to fall behind other nations industrially. The Earl of Balfour, in the Messel Memorial Lecture, made an eloquent plea for a re-examination of the relations between industry and science; and there is no question that that re-examination must be made from both sides, so that the coming together may derive greater momentum from mutual desire. The application of science to industry has been developing for some years; but in many directions not at the rate that is essential to the realization of the optimum good in present circumstances. Precedent to this coming about, however, there must be inculcated among our leaders of industry the benefit of greater scientific investigation, and the power of mind practically and profitably to utilize the advances of science. We are drifting that way; but a stronger impulse is needed. That must come in the first place from those who already know the indispensability of the union of science and industry; and those who have the greatest knowledge of that are the scientists.

In the Messel Memorial Lecture, Lord Balfour had much to say regarding the practical applications of scientific research, of which, as the head of the Department of Scientific and Industrial Research, he has had opportunities of making a close study. The field for work he finds is immense; and it is easy to see that underlying all he had to say is the feeling that this country must, through research, make itself as self-supporting from its own resources as is possible. There is by him realization of how comparatively small is the scope of our raw materials, and yet how great the variety of products already obtained from them. Just think, for example, of the numerous products dependent on coal, water, and air. From these sources of productivity have arisen some of the most notable results of industrial development. We turn aside for a moment to a remark made by Sir Max Muspratt at the opening of the exhibition of British chemical plant manufacturers. He said the chemical industry is learning to do without coal, and that, if necessary, it will be able to adapt itself to doing without coal altogether. It is true we can get much from air and water. For instance, we are not, as Sir Alfred Mond said at the dinner of the Society of Chemical Industry, now wholly dependent on coal for fertilizers and other ammonia requisites. The production of synthetic ammonia from the air has become one of the greatest industries of the world, and to it no limits can be set. All the same, we have to rely upon coal, and so do the chemists for a large part of their basic requirements; and, despite what Sir Max said, the country will have to place more and more reliance upon coal in the future. That being so, it is up to the country and to its scientists to see that the coal that is used is treated in a manner which will impart the greatest profit. Prodigal use of coal to-day, and the continued sacrifice of its properties, will mean the quicker impoverishment of the country. Through the scientific use of coal, that eventuality will be deferred, and the country will make itself more self-supporting.

Lord Balfour referred to the need of making the country more productive in respect of oils. In this connection, we find that to him low-temperature carbonization is a valuable and interesting process which is on the way to accomplishment, and which will contribute to our home oil supplies. But he foresees more important developments from some process such as the direct hydrogenation of coal—by, for example, the Bergius process. It is certain that the oil wells of the world will not remain steadfast always in meeting the growing requirements for petroleum products of all kinds, and that we shall have to look to other sources of supply. But we must not be dogmatic concerning those sources. In this as in other things, it will be the fittest for the purpose that will survive. Work is proceeding in several directions, with the view of securing not only oil, but a commercial balance of other products, which will result in the release of the properties of coal to the utmost value. It is too soon to fix our beliefs on any one mode of developing home oil supplies from coal. Then there is power alcohol, which has opened up an Imperial question, to which the Governments of our tropical possessions and Dominions will have to give more attention than hitherto. In that direction, the gas industry and the coking industry will find an ally and not a competitor, seeing that, in admixture with benzole, alcohol would do much to make our country independent of imported motor fuel.

There is another way in which chemical research can help all industries—in the elimination of waste. This was the theme of the Presidential Address of Sir Frederick Nathan to the Institution of Chemical Engineers. All waste means uneconomy and inefficiency; its elimination greater economy and efficiency. Present preservation of waste is due to the human factor. It is not recognized in some industries which have got into ruts in their processes that there is waste. This is due to ignorance and personal inefficiency; while in other cases there may be knowledge of waste, but not the necessary skill, or technical or scientific ability, to ascertain how the waste may become profitable by a change in procedure, or by its utilization for some useful purpose. That is where the chemist again comes in—to provide direction for the engineer, whose skill can then be concentrated upon the devising of means to produce practical effect. But the first difficulty is to convince those in power in industry that these things can be brought about. Even with large object-lessons before them, as provided by concerns whose operations are scientifically controlled, there are many men in important places in industry—in the gas industry, for example—who are so shortsighted that they fancy they see more waste than profit in adopting the means of elimination of waste in their processes. If they were correct, then we should say maintain the old conditions. But it is not true in very many directions. However, the work of persuasion and conviction is difficult; but it has to be undertaken, and with perseverance. In some instances, only the ability of one manufacturer, through the efficiency of his processes, to sell his products at a lower cost than others who have not applied themselves to the elimination of waste and the gain of higher efficiency, will be effective in inducing them to follow the good example.

Economics of Smokeless Fuel Production.

DURING the last year or two, there has been a satisfactory outburst of enthusiasm in connection with the production by existing coal-carbonizing processes of a smokeless fuel of good ignition and combustible properties. In the promotion of consideration of this matter by coal carbonizers, the Society of Chemical Industry have taken a good part—especially through the conferences which they held at Leeds and Sheffield, in conjunction with the Institution of Chemical Engineers, the Institution of Gas Engineers, and the Coke-Oven Managers' Association. We may also claim that the Coke Competition, which was organized by the "JOURNAL" (through the munificence of the Woodall-Duckham Companies) contributed to the literature of the subject information of generous value. Now the Society of Chemical Industry has a Fuel Section; and, as reported in last week's issue of the "JOURNAL" (p. 195), the first official meeting of the Section has been held, with Prof. Arthur Smithells, F.R.S., in the chair. For such an occasion, it was appropriate that a summary of the work done at the Leeds and Sheffield conferences, together with an indication as to the state of scientific view on the essentials of coke for domestic purposes, should have been prepared and presented. This, as will have been seen from the account

of the proceedings published last week, was done by Dr. E. W. Smith, and in a most able and concise manner, having regard to the largeness of the subject. The reason he gave for consideration being limited to domestic coke is that coal in the industrial world is used more efficiently and less noxiously as regards atmospheric pollution than is coal in domestic service. But at the same time, any improvement which can be effected in coke for domestic purposes will also be of advantage to users of coke for industrial heating.

The whole question of the provision of an improved coke resolves itself into one of economics; and, in this instance, the economics are of a far-reaching order. As Dr. Smith showed in his digest of the position of this matter (apart from the questions of ash and moisture in coke), the production of a higher standard coke which will have better ignitibility and combustibility is reduced to two courses: One the retention in the coke of a higher volatile content (say) 9 or 10 p.ct.; and the other, treatment of mixtures (in suitable proportions) of coking and non-coking coal, with the view of altering the physical structure of the ultimate coke in such manner that ignitibility and combustibility are promoted, despite a low volatile content. In considering the economics of the question, if it is possible (as we know it is) to reduce from 9 or 10 p.ct. the volatile content to 2 or 3 p.ct., the difference means a higher production of valuable commodities per ton of coal. To save that difference, therefore, is a consideration of no mean importance. When we come to the question of the mixing, in suitable proportions, of coking and non-coking coal, which will produce a coke of the right physical structure, we are brought face to face with two other considerations bearing upon the question of economics. The first is the cost of the blending, and the other the *per contra* account. Against the cost of blending can be set, first, the larger field from which coal can be purchased. Secondly, the breaking-down, through the presence of the non-coking coal, of the plastic layer in the retort charge, which retards the transmission of heat through it, and thus necessitates a longer period of heat application to, and retention in the retort of, the charge in order to produce its sufficient carbonization. Given a quicker transmission of heat and a shortening of the carbonization period, a lower intensity of heat would be required, and a lower quantity of heat per ton of coal dealt with, which means a saving of fuel. Furthermore, given a more rapid heat transmission and carbonization, this should facilitate a greater throughput of coal, which would afford compensation for the lower gas productivity of the proportion of non-coking coal in the charge. These, admittedly, are generalities which, thoroughly to establish them, require careful and systematic investigation.

One thing that is not a generality, but is a proved condition through the extensive experimental work which has been carried out, is that the controlled blending of coal gives a coke of improved physical characteristics, with normal volatile content, and those ignitible, combustible, and transportable properties which are essential. That fact demands that the matter shall not be left where it is, but shall be the subject of well-ordered investigation on the part of the carbonizing industries (or of the gas industry, which has most to gain from it), in order that the whole economic position may be fully explored. There are investigators—like Mr. Harald Nielsen—who have proved that, by the utilization of special classes of coal (nutty coal, for instance), and special methods of treatment, a coke having the qualities referred to can be produced without blending. But this appears to impose a limitation to naturally suitable coals, and the adoption of an entirely new process of treatment. Altogether new economic conditions are thus brought in as factors—particularly qualitative and quantitative differences in products and market values, with the possible greater susceptibility of those values to variation. During the discussion other questions were raised, particularly by Mr. H. J. Hodsman, Dr. Lander, Dr. Parker, and Dr. Lessing, with the result that, having regard to the variety of views expressed, there can be agreement with the submission that the whole of the fundamentals of this question demand thorough investigation in order to examine the problem of coke production and possibilities from its very root.

Throughput or Gas Therms.

One other point of importance arises from the discussion at the Conference on Smokeless Fuel. Dr. Lander stated that, at the Fuel Research Station, a certain amount of experimental work has been done with a view to the production of a more free-burning coke, using the existing vertical retorts. As a result, he is not sure that it is always correct to reduce the economics of the gas-works process to a tonnage basis; in some cases, he thinks it might be sound to reduce it to a cost-of-production basis. The experimental work has somewhat disturbed his views on the point. What he has been doing in these particular experiments is to hasten the throughput of the vertical retorts from 2·5 tons to 5·02 tons per day; but, as a result, the gas yield fell from 97 therms to 68 therms per ton. But though the yield per ton is lower, the make per retort per day rose from 244 therms to 342 therms—an increase of about 40 p.ct. The calorific value went up from 469 to 570 B.Th.U. per c.ft.; and the specific gravity came down a little. There was an increase of coke and tar per ton. The working temperature was 1260° C.; and the fuel gas per therm of gas made showed a decrease of 11 p.ct. Dr. Lander gave these figures for what they are worth, and did not express any definite opinion upon them. Perhaps this was as well, until they have been thoroughly explored from the financial point of view, because here, again, the question of economics comes in. In the first place, we have the same carbonizing plant dealing with more than double the quantity of coal per day, which is a gain in capital charges per ton or therm in respect of carbonizing plant. There is also the gain in fuel gas per therm of gas made. On the other hand, though the therms per retort per day increased by about 40 p.ct., the gas therms per ton of coal were reduced by nearly 30 p.ct., which means the handling of about one-third more coal to satisfy the gas therm demands. Probably the coke being more easily ignited and of better combustible quality would be worth somewhat more as a domestic fuel; but no particulars are given regarding the *x* quantity of additional tar made, upon which a value could be placed. The whole question is, Would a balance-sheet show an improved financial result, having regard to the loss of 30 p.ct. of therms per ton, even though the capital charges on the carbonizing plant per therm of gas are reduced, and somewhat better returns are obtained from the coke and tar? In other words, would the financial issue result in the ability to sell gas therms cheaper? Those are matters which would have to be settled before placing any value upon the results of the experiments quoted by Dr. Lander—interesting though they be.

Emergency Regulations.

The House of Commons on Friday approved of the Regulations under the Emergency Powers Act being continued for another month.

Minimum Sliding-Scale Dividend.

Last week the House of Lords Committee, who considered the Gas Light and Coke Company's Bill, had before them the draft of the new clause which applies to the minimum dividend of 5 p.ct. which the Company, with the sanction of Parliament, are introducing into the sliding-scale. There was some discussion over certain words which the Company desired should be included in the clause, and the Committee would not accept them. As it will stand in the Act, the new clause is published in our "Parliamentary Intelligence." It is to have effect from March 1, 1927. The reason that this date has been selected is that, by March 1 of any year, the complete accounts of the previous year will be available; and by March 1, 1932 (which is the first date on which an application for revision can be made), complete accounts for the first five years will be available.

Coal Imports and the Emergency Regulations.

According to a reply by the Home Secretary to a question in the House, British "citizens" are at liberty to go abroad with the avowed object of preventing the export of coal to

Great Britain, although urgently needed for the maintenance of the industries of the country. It appears that, as the Emergency Regulations do not apply abroad, no action can be taken in the matter of any conspiracy between British "citizens" and representatives of the coal miners abroad.

Electricity Supply Bill.

In the notices of motion for the House of Commons last Thursday, were two referring to the Electricity Supply Bill. One was a proposal to insert in the measure the rejected clause regarding the authorization to local authorities to supply and sell electric wiring and fittings, and the other was intended to secure that no part of the moneys raised or secured by the Government guarantee should be expended upon plant or machinery which has not been manufactured in the United Kingdom or the British Empire, except in the case of any particular plant or machinery in respect of which the Minister of Transport thinks fit, for any special reason, to direct that the provision shall not apply.

Power Supply During Strikes.

As will be seen by our "Electricity Supply Memoranda," electric power consumers can call to book local authorities who, being electricity purveyors, fail to supply them with energy during a strike. Lord Banbury is anxious that such consumers should also have the power to obtain compensation for any damage inflicted where the supply is discontinued owing to the instigation of strikers or their leaders. When the Swindon Corporation Bill was before the House of Lords on Tuesday of last week, his Lordship moved the insertion of a clause to secure to consumers compensation in such cases. He mentioned that among the strikers at Swindon, during the general strike, were members of the Electricity Committee; and his view was that the members of the Corporation should be made severally and individually responsible for any deliberate stoppage of the supply to industrial premises, and should pay compensation for any damage inflicted. The Earl of Donoughmore appealed to Lord Banbury not to press an amendment of this nature in a Private Bill, but expressed his readiness to join in an appeal to the Government to secure the introduction of such a provision—perhaps in the Government Electricity Bill. The suggestion no doubt helped to influence Lord Banbury to withdraw the clause of which he had given notice.

British Association Meeting.

From the very full programme arranged for the Oxford meeting of the British Association for the Advancement of Science (which commences to-day, and will continue for a week), there does not appear to be much which will have direct interest for "JOURNAL" readers. The President this year is Prof. Horace Lamb, Sc.D., D.Sc., LL.D., F.R.S. Regarding the sectional work, the President of Section "B" (Chemistry) is Prof. J. F. Thorpe, F.R.S.; and his address will be directed to the "Scope of Organic Chemistry." In Section "G" (Engineering), Sir John Snell, the Chairman of the Electricity Commissioners, will preside, and will deliver an address on the "Present and Future Development of Electricity Supply." After the criticisms which have been made of the Government electricity supply scheme, probably Sir John will find some interest in attending the meeting of Section "J" (Psychology) at the time Prof. C. Spearman, F.R.S., will be discoursing on "The Origin of Error." A paper will also be given by Mr. J. M. Kennedy on the "Distribution of Electrical Energy," which will discuss the position under the generating concentration scheme, and the closing of uneconomical stations. Mr. D. R. Pye is contributing a paper on "High Duty Compression Ignition Engines." Among the public lectures will be one by Sir Dugald Clerk, F.R.S., to be delivered on Saturday evening, Aug. 7.

Unemployment.

The improved importation of coal is having an effect upon employment in the country. The number of persons on the registers of the Employment Exchanges in Great Britain on July 19 was 1,631,300. This was 12,894 fewer than the week before, but 409,388 more than a year ago. The total of 1,631,300 on July 19 is exclusive of persons who ceased work in the coal-mining industry.

Trade Union Law.

The Committee of Ministers appointed to examine the law relating to trade unions have submitted to the Government a report and the rough draft of an amending Bill. It is believed that it will be possible to introduce the Bill to Parliament during the autumn sittings.

PERSONAL.

The Directors of the Gas Light and Coke Company have appointed Mr. D. A. WINTER, B.Sc., A.R.C.S., D.I.C., to the Company's Research Fellowship at the Imperial College of Science and Technology for one year from Oct. 1 next, in succession to Mr. F. R. WESTON, B.Sc., F.I.C.

Recently elected members of the Society of Chemical Industry include Mr. CHARLES BATEMAN, of the Bath Gas Light and Coke Company; Dr. MARGARET FISHENDEN, of London; Mr. HERBERT B. HOLLIDAY, of the Wallasey Gas-Works; and Mr. CORNELIUS B. TULLY, of London.

Alderman THOS. MITCHELL, J.P., who has been Chairman of the Stoke-on-Trent Gas Committee for fourteen years, was recently honoured by H.M. the King, who conferred upon him the Membership of the Order of the British Empire, in consideration of his public work in Stoke-on-Trent, more particularly in connection with the National Savings movement.

At the annual meeting of the Wellington Tube Works, Ltd., on July 29, the Chairman reported the resignation of Mr. W. H. NOCK, their Managing Director. Mr. Nock has had 45 years' continuous service with the Company. The Chairman stated that it was with much regret that the resignation had been accepted, though the Directors realized that after so many years' service the action he had taken was a wise one. They wished him every happiness and many years to enjoy his well-earned retirement. His many friends will be pleased to know that his services will not be altogether lost, as he is retaining his seat on the Board. Mr. DOUGLAS W. TURNER, the Chairman of the Company, was elected Managing Director to fill the vacancy.

OBITUARY.

JAMES STEWART.

It is with sincere regret that we learn of the death, at Bournemouth, on July 28, of our long-time friend, Mr. James Stewart, who, for a considerable period (while on the staff of the "Manchester Guardian") represented the "JOURNAL" in the Manchester district, until he became the principal proprietor of the "Gas World," and ultimately its Editor, in succession to the late Mr. John Allan, who was formerly associated with the "JOURNAL" as its representative in Scotland. For some years Mr. Stewart directed with skill the fortunes of the "Gas World;" and when that paper became merged in the family of technical publications of Messrs. Benn Bros., Ltd., our friend became a Director of the Company—still acting as Editor of our contemporary till he retired at the end of 1918. Since then he had enjoyed fairly good health; and his end came unexpectedly to those about him. Mr. Stewart leaves a widow, one son, and two daughters. The son, Dr. J. Lennox Stewart, has had a brilliant career in his profession, both during the war and since; and to-day he holds a medical position of a highly responsible character in South Africa.

FORTHCOMING ENGAGEMENTS.

Aug. 17-18.—IRISH ASSOCIATION OF GAS MANAGERS.—Annual meeting in Dublin.
Sept. 2.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual meeting at Glasgow.
Sept. 6-18.—SMOKE ABATEMENT EXHIBITION, at Birmingham.
Sept. 9.—"B.C.G.A."—Midland conference postponed until spring, 1927.
Sept. 11.—GAS SALESMEN.—Annual meeting at Birmingham.
Sept. 14.—NATIONAL GAS COUNCIL.—Meeting.
Sept. 14.—FEDERATION OF GAS EMPLOYERS.—Meeting.
Sept. 14-16.—INSTITUTION OF PUBLIC LIGHTING ENGINEERS.—Conference at Newcastle.
Sept. 16.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Official visit to the Smoke Abatement Exhibition, Birmingham.
Sept. 20.—EVENING STAR LODGE.—Emergency Meeting.
Oct. 25-27.—"B.C.G.A."—Annual conference at Newcastle.

INSTITUTION OF GAS ENGINEERS.

Sept. 13.—Emergency and Finance Committees.
Sept. 14.—Advisory Committee on Education.
Sept. 20.—Council meeting.
Sept. 21-23.—Postponed Annual Meeting.
Sept. 24.—Visit to Hastings.

ELECTRICITY SUPPLY MEMORANDA.

IT appears that endeavours are still to be made to secure amendments in the Government Electricity Supply Bill; but we think they will be useless. The Association of British Chambers of Commerce are urging the Government to give effect to the "earnest" desires of the commercial community, who are gravely concerned over certain aspects of the scheme. The Committee submit that the standardization of frequency in large and already efficiently developed areas should be optional; they hold that the legitimate interests of owners of efficient electricity undertakings will be adversely affected financially and technically; also that the industrial areas may have to bear the burden of uneconomical areas, and that the direct supply of electricity by the owners of efficient electricity undertakings should not be interfered with. Turning to Birmingham, from what transpired at a recent meeting of the Chamber of Commerce in that city, it is clear the members are very much grieved that the Government have rejected the amendment which provided for the payment of reasonable compensation to electricity consumers for disturbance during the period of the change of frequency from one standard to another. They feel that, in the case of manufacturers receiving a public supply of electric power, it will be imposing a great hardship if they are required to change their plant without compensation. In view of this, there are to be representations to the Minister of Transport urging the Government even now to modify the present proposals. The Edinburgh Chamber of Commerce have also had the matter under consideration, and have received a report from Prof. William Oliver. He considers that the scheme outlined in the Government Bill as an ideal is admirable; but he regards as a somewhat doubtful point the promise that it will bring about cheap electricity. The method of attempting to do this is open to question. In Prof. Oliver's opinion, the powers conferred upon the Central Electricity Board are autocratic to a degree, and may bear hardly on efficient stations of standard frequency which have been carefully built up by individual initiative and foresight. Never before has it been proposed to give such uncontrolled power to a Government Department. He finds it difficult to understand how certain efficient undertakings already supplying power at ¾d., or even less, per KW.-H. would not, under the scheme, require to increase their charges to the consumer. In Edinburgh, the present price per KW.-H. for power in reasonable quantities is ¾d., with certain rebates for large quantities; but outside in the surrounding country areas served by the Lothians Electric Power Company, the price is greater, and depends on the maximum KVA. demand *plus* the KW.-H. taken. To him, it is clear that the industrial centres will be penalized in order to bring down the rural price of energy to the standard penny rate aimed at. The remote localities can only represent a very small proportion of the power-consuming area of Great Britain. It is clear from the foregoing movements that the Government will find they have not yet satisfied important representative bodies in the country.

Penultimate Efforts.

Flat Rate Supplies from Selected Stations.

We are wondering what will happen in the case of undertakings which supply at widely varying prices for different purposes when they receive supplies of electrical energy at a flat rate from the Central Electricity Board. The old argument will cease to apply—that, in order to develop the cooking and heating loads to help to keep the generating and distributing plant at work, a price which little more than covers the cost of coal must be charged. The point is, Will the undertakings buying at a flat rate be able to justify their present prices? Those who will cease to generate on their own account will, we take it, be charged a uniform sum for their supply at whatever time of day the demand arises. In the second schedule to the Government Bill, as amended in Standing Committee, rules are given for determining the cost of production of electricity at selected stations; and from these it is seen that all charges are very completely covered, with no indication of the absurdity of making a charge for any purpose merely fractionally in excess of the cost of coal. The rules state that the cost of production is to be ascertained by calculating the following costs, charges, and allowances in respect of the year of account:

(*a*) The sums expended for fuel, oil, water, and stores consumed, for salaries and wages, and any contributions for pensions, superannuation, and insurance of officers and servants, and for repairs and maintenance and for renewals not chargeable to capital account.
(*b*) Sums paid as rents, rates, and taxes, other than taxes on profits and for insurance, in respect of the station.
(*c*) The proper proportion of management and general establishment charges attributable to the station.
(*d*) Interest (exclusive of interest payable out of capital) on money properly expended for capital purposes (whether defrayed out of capital or revenue), and attributable to the generating station and the plant suitable to, and used for, the purpose of generating electricity thereon, and interest on working capital properly attributable to the station and the production of electricity thereon.

There are also conditions referring to the rate of interest and the allowance for depreciation. The supply for whatever purpose it is used will be dealt with according to those rules.

Transmission Charges.

In the third schedule, too, we have the rules applying to the charges and allowances to be made in respect of transmission lines used by authorized undertakers for giving supply in bulk. It is seen that these charges and allowances are not by any means of a light order. For example, we get a proper proportion of management and general establishment charges attributable to the transmission line, sums paid as rents, rates, and taxes (other than taxes on profits), in respect of the transmission line; the actual cost of the maintenance of the line; the cost of units lost in transmission; interest on money properly expended for capital purposes; and an allowance for depreciation. Transmission charges will be an unknown quantity until calculated; and, added to the generation costs, it is seen how speculative the scheme becomes compared with local generation.

Profits in Aid of the Rates.

In the fifth schedule, there are certain amendments of the schedule to the Electric Lighting (Clauses) Act, 1899. In this, provision is made for the distribution of any net surplus remaining in the hands of undertakers in any year, together with the annual proceeds of the reserve fund when amounting to the prescribed limit. The net surplus may be allocated (1) to a reduction of the charges for the supply of energy; (2) to reduction of the capital money borrowed for electricity purposes; (3) with the consent of the Electricity Commissioners, in payment of expenses chargeable to capital; (4) in aid of the local rates. There is, however, a provision that the amount which may be applied from surplus profits in aid of the local rates in any year shall not exceed 1½ p.ct. of the aggregate capital expenditure on the undertaking; and after March 31, 1930, no sum shall be paid in aid of the rates unless the reserve fund amounts to more than 1-20th of the aggregate capital. These are useful limitations.

General Strike Sequel.

Did the Walthamstow Borough Council do all possible to preserve the supply of electrical energy to manufacturers and traders during the general strike? We do not think they did. They seem to have made no effort whatever, but surrendered to the first threat that the men would be withdrawn from the electricity station if they did not bow to the dictation of the trade unions. They simply allowed themselves to be stampeded by the unions; and their obligations to the industrial consumers were scattered to the four winds. In other words, they admitted that in Walthamstow the trade union representatives had supremacy over the elected representatives of the ratepayers. We have no sympathy for such a local governing body; and there is gratification in finding that five firms had the courage to summon the Council for a betrayal of the trust reposed in them. The summonses were for unlawfully failing to supply current as required by the Electric Lighting Acts. What was pleaded on behalf of the Council was that what they did was in order to save the lighting of the district, which was regarded as the essential service. On May 5 they received an ultimatum from their employees that, unless they agreed to discontinue supplies for commercial purposes, the whole of the men would be withdrawn; and it was alleged that the orders came from the Council of the "T.U.C." A result of the submission of the Electricity Committee and the Council to these threats was that works were closed, and people were thrown out of employment—the works of the plaintiffs among the number. For eight days the Council did nothing whatever to obtain assistance; and the curious thing is that, though industrial services were cut off, cinemas continued to receive a supply. Surely they were not such essential services as industrial works. The result of the appearance of the Council at the Stratford Police Court was the insufficient penalty of 20s. for each day on which there was omission to supply, and 25 guineas costs. The Council should think themselves lucky that they were let off so lightly. Being a local governing body, they should have shown more energy and courage in protecting the ratepayers, who, after all, are more important than a handful of men dominated by a trade union.

Waste at Bradford.

Economy and efficiency in public lighting should go hand in hand, and should have precedence in consideration by all municipal authorities. The Bradford Corporation appear to be losing sight of this; and there is a tendency on the part of a majority of the members to favour electricity at the expense of gas. Even majorities can sometimes be wrong, and may arrive at decisions that are not well-founded. For example, to hand

over the lighting of the streets for the sole purpose of giving more custom to the electricity undertaking, because it may not be so inherently strong as the gas undertaking, would be to make a change on secondary grounds, while the two primary considerations should be reliability and economy. There is no question as to the illuminating efficiency of gas; but efficiency goes beyond that—by including absolute dependability. Gas is not disposed to collapses as is electricity. To that point local authorities appear to pay no conscientious regard. At the last meeting of the Bradford City Council, the Street Lighting Sub-Committee recommended that dual lighting on many roads should cease as soon as possible, but an amendment was passed which added to the proposal "where such dual lighting is found to be unnecessary." It seems that a scheme of electric lighting is *sur le tapis* which contemplates placing the lamps on the tram standards, where they would be subject to all the vibration which the running cars can bring to bear upon them, and which would leave many yard and passage ends in darkness. It is the latter consideration which led the Council to add the quoted words to the recommendation. After this the main recommendation was attacked—that electric lighting be substituted for gas on the main tram and trolley vehicle routes. An amendment was proposed by Alderman Pickles that the change should be made by way of experiment on one route only. To adopt the Sub-Committee's recommendation, he asserted, would mean scrapping gas lighting on fifty miles of road, and removing 2046 gas-lamps at a cost of £1 each, excluding the value of the lamps themselves. On the point of economy he stated that it would cost £22,468 to replace the gas-lamps by electric ones, while the estimated annual cost of the new scheme was £15,823, as compared with £15,260, which is the cost of lighting the same roads by gas. Why Bradford should indulge in such prodigality we are at a loss to understand. The ratepayers are not going to obtain any profit from the change; but they will have to bear the financial burden of it. The Council, by 45 votes to 22, rejected the amendment, and so registered their persistence in taking the retrograde step of spending money in displacing a reliable system of lighting for something which is less so. That is not good statesmanship.

INSTITUTION OF GAS ENGINEERS' EDUCATION SCHEME.

List of Successful External Candidates in the 1926 Examinations.

For publication we have received from Mr. Walter Hole (the Organizing Secretary) the following list of the successful candidates (external) in the recent examinations in Gas Engineering and Gas Supply held under the Education Scheme of the Institution of Gas Engineers. The results as far as the college-trained students are concerned will be published as soon as those of the examinations in ancillary subjects have been received and confirmed by the Board of Education.

GAS ENGINEERING.

ORDINARY GRADE.

Name.	Class.	Ancillary Subjects.
Stoddart, Charles Easton	1st W.D.*	Maths., Chemistry, Machine Drawing, Mechanics.
Baker, Eric Edward	1st W.D.	Maths., Chemistry, Physics, Machine Drawing.
Ashbee, Douglas Gordon	1st	Maths., Chemistry, Machine Drawing.
Brown, John Joseph	1st	Maths., Chemistry, Physics, Machine Drawing.
Clapham, Thomas William	1st	Maths., Engineering Science, Machine Drawing, and Design.
Deas, Cleveland Alexander	1st	Maths., Mechanics, Building Construction.
Kleist, Leslie Leonard	1st	Maths., Chemistry, Physics, Mechanics.
Lilly, Kenneth A.	1st	Maths., Chemistry, Applied Mechanics.
Madden, Terence Henderson	1st	Maths., Physics, Chemistry, Machine Drawing, Mechanics.
Millett, Horace David Victor	1st	Maths., Chemistry, Engineering Drawing.
Monroe, Colin R.	1st	Maths., Chemistry, Physics, Machinery Drawing.
Parker, Arthur Charles	1st	Maths., Chemistry, Machine Drawing, Mechanics.
Williams, John Harold	1st	Maths., Chemistry, Physics.
Lowe, Frank	2nd	Maths., Chemistry, Physics.
Marshall, James Saddler	2nd	Chemistry, Machine Drawing, Building Construction.
Maycock, Harry	2nd	Maths., Chemistry, Applied Mechanics, Machine Construction, and Drawing.
Morton, Robert	2nd	Chemistry, Physics, Machine Drawing.
Scoular, Russell Calvert	2nd	Maths., Chemistry, Mechanics, Machine Drawing.

* W.D. = With distinction.

HIGHER GRADE.

Name.	Class.	Ancillary Subjects.
Pallister, John Walter	1st W.D.	Applied Mechanics, Theory and Design of Structures, Strength and Elasticity of Materials, Theory of Heat Engines, Hydraulics.
Stephenson, Edward William	1st W.D.	Chemistry, Applied Mechanics, Machine Drawing, Building Construction.
Benson, Donald	1st	B.Sc. in Chemistry, Building Construction, Machine Drawing.
Canning, Thomas Anthony	1st	Maths., Chemistry, Physics, Machine Drawing, Mechanics.
Huntley, Thomas	1st	Inorganic and Organic Chemistry, Engineering Drawing, Theoretical and Applied Mechanics, Pr. Physics.
Owen, John Richard	1st	Chemistry, Heat Engines, Machines, and Hydraulics.
Harrison, Louis William	2nd	Maths., Mechanical Engineering, Pr. Fuel Technology, Machine Construction, and Drawing.
Haworth, Thomas	2nd	Maths., Chemistry, Physics, Building Construction.
Kirkhope, John	2nd	B.Sc. in Chemistry, Maths., Physics, Engineering Drawing.

DIPLOMA.

Name.	Class.	Subject of Thesis.
Goldsmith, James Howard	1st W.D.	Some Points in the Design and Operation of Horizontal Retort Settings.
Wright, Stewart Lord (B.Sc. in Gas Engineering, Leeds University)	1st W.D.	The Use of External Producers for Heating Retort Settings.
Thomas, Harold Hirst (B.Sc. in Gas Engineering, Leeds University).	1st	The Effect on the Gas-Making Value of Gas Oil of its Previous Use for the Removal of Naphthalene from Coal Gas.
Miles, Sidney Herbert	2nd	Carbonization: Present and Future.

GAS SUPPLY.

ORDINARY GRADE.

Name.	Class.	Ancillary Subjects.
Beaumont, Frank	1st	Maths., Chemistry, Physics.
Calderwood, Robert Wallace	1st	Maths., Chemistry, Machine Drawing.
Davies, Charles Swainson	1st	Maths., Inor. Chemistry, Mechanics.
Douglas, Robert	1st	Maths., Physics, Mechanics, Heat Engines, Machine Drawing.
Greaves, Ralph Lincoln	1st	Maths., Chemistry, Physics, Engineering Science.
Leather, Arnold John	1st	Maths., Mechanics, Machine Drawing, Heat Engines.
Pickles, Leslie Sutcliffe	1st	Maths., Chemistry, Physics, Machine Drawing.
Brown, Kenneth Edwin Benson	2nd	Maths., Machine Drawing, Mechanics.
Jack, Harold	2nd	Maths., Chemistry, Machine Drawing, Mechanics.
Jarmin, Clifford Stephen	2nd	Maths., Mechanics, Machine Drawing, Heat Engines.
Smith, Charles Edward	2nd	Maths., Chemistry, Machine Drawing, Mechanics.
Staniforth, Claude Bertram	2nd	Maths., Chemistry, Physics, Mechanics, Machine Drawing.

HIGHER GRADE.

Atkin, Frederick Lawrence	2nd	Chemistry, Physics, Heat Engines, Applied Mechanics.
Caesar, John Ernest Victor	2nd	Chemistry, Physics, Mechanics, Maths., Building Construction, Machine Construction, and Drawing.

GAS EXAMINATION PRIZE WINNERS.

Awards by the Society of British Gas Industries.

We have received from the Secretary of the Society of British Gas Industries (Mr. Arthur L. Griffith) the following list of winners of the prizes given by the Society in connection with the recent City and Guilds of London Institute examinations in Gas-Works Practice, Gas Supply Practice, and Gasfitting.

GAS-WORKS PRACTICE.

First Prize, 5 Guineas.

John Tomlinson, examined at the College of Technology, Manchester.

Second Prize, 2 Guineas.

Colin Robson, examined at the Technical School, Stockton-on-Tees.

GAS SUPPLY PRACTICE.

First Prize, 5 Guineas.

John Ford, examined at the Heriot Watt College, Edinburgh.

Second Prize, 2 Guineas.

Francis Horace Gee, examined at the College of Technology, Manchester.

GAS-FITTING.

First Prize, 5 Guineas.

John Hill, examined at the Royal Technical College, Salford.

Second Prize, 2 Guineas.

Frank Harold Fryer, examined at the Technical School, Dudley.

AMERICAN PROSPERITY, WITH SPECIAL REFERENCE TO "THE SECRET OF HIGH WAGES," BY AUSTIN AND LLOYD.

By G. M. Gill.

Many readers of the "Journal" have no doubt read that inspiring little book "The Secret of High Wages," by Bertram Austin, M.B.E., M.A., and W. Francis Lloyd, M.A., A.M.I.E.E., published by T. Fisher Unwin, London; price 3s. 6d.

There is much to learn from its perusal, and the same can be said of the report of the "Daily Mail" Trade Union Mission to America. Both deal with the same problem, and both give irrefutable evidence of the means whereby wages rule so high in the United States compared with those in England. These wages are really high—that is, in purchasing power, which is the only factor that actually counts.

Mass Production the Main Cause of American Prosperity.

Mass production organized on proper lines is the whole secret of these high wages, and incidentally of the immense prosperity which is so evident in America.

Henry Ford, with exceptional foresight, started this system, and the other leaders of American industries quickly appreciated the possibilities, and followed his lead. I myself have visited the Ford Motor Works, which is indeed an inspiring sight; but I should not like to be a workman there, though I believe that they are very well treated and have more than their share of this world's goods.

The mass production system, however, has come to stay, and it is the only known way of cheaply producing articles in large quantity. England will be left far behind unless she follows the American lead to a much greater extent than has so far been done. Mass production does not lend itself to gas manufacture, though many of its principles are applicable in an adapted form to the making of gas, especially on a large scale. The system is, however, of interest to many manufacturers who rely mainly or partly on the gas industry to purchase their goods, and who doubtless form no small part of the readers of the "Journal."

The authors of this book have told their story very well, and have adopted the plan of laying down in the first place certain main principles of the American system, and of then dealing with each of these principles in a separate chapter. Space will not permit of any comprehensive description of the book, but I cannot resist including a table which gives in a nutshell the results of the American producing methods.

Wages Rates and Cost of Living.

The figures are taken from an annual report of Mr. Hoover, the United States Secretary of Commerce, published on Nov. 29, 1925, in which he quotes the Department of Labour index of the movement of wages and prices from 1920 to 1925, using the 1913 levels as the unit of 100. The price percentages represent the average wholesale prices of all commodities.

Year.	Wage Rates.	Prices.
1920	199	226
1921	205	147
1922	193	149
1923	211	154
1924	228	150

"A comparison with similar British indexes," the report continues, "gives striking evidence that these results are peculiar to the United States."

Again taking the 1913 levels as the unit of 100, the corresponding figures for Great Britain are as follows:

Year.	Wage Rates.	Prices.
1920	230	283
1921	260	181
1922	200	159
1923	170	162
1924	170	174

This makes sorry reading for a Britisher. No industry is more interested in the general prosperity of British trade than that devoted to gas, and there is no doubt that an appreciable proportion of the higher wages which could be paid under a more enlightened system of production would come into the coffers of the gas undertakings.

One chapter of this book deals with "Promotion by Merit Only," this principle being followed to a much larger extent in the States than here. Hereditary rights or claims to a position cut no ice there.

I have met many Presidents and Vice-Presidents of large companies in the States, and I have been much impressed with their exceptional knowledge of the minor details of their own business and of that of the industry in which they are working. There is, it seems to me, a greater interest taken in the statistics of their results and costs; and this is shown by the manner in which these are carried in their head to an extent which has always surprised me. The same men are intensely democratic, and are on terms of close familiarity with their immediate subordinates, christian names being freely used on both sides, but, so far as I can see, without any ill-effects resulting. In spite of the free and easy manner in which the subordinates treat their chiefs, this does not in any way affect the freedom with which the latter will "fire" the former in the event of any incompetency.

A further point brought out in this book is the ready opportunities which exist for a workman to rise, and become a manager. There is no prejudice to such promotions. In this connection I have been impressed with the very considerable facilities which are provided for all classes to obtain a really sound education both in the preliminary stages and later in the actual training for specialized work, such as engineering in all its branches and in the study of mass production methods.

Such education and training is largely carried out at the public expense; and it is possible for a single man to work during the summer and earn sufficient to live and to pay for his training at a College during the winter. One superintendent of a large coke oven plant told me that he was an engine fitter in England, and came out to America, and qualified in this way for his present appointment.

The next chapter (III.) deals with "Small Profits and Quick Returns." This principle, while well appreciated in this country, does not seem to be practised as much as it is preached. Small profits are obviously of no use unless the bulk sold is large; and this is the problem, as until the quality and price is right, the bulk sold will not be large, and the price cannot be right until the sales are large.

Necessary Preliminaries to Mass Production.

The American manufacturer has overcome this difficulty, first by amalgamations or arrangements with other firms in the same line, in order that goods of the same variety, type, and size can be made in one factory, and secondly by concentrating upon standardization of varieties. Competing manufacturers are ready to get together and standardize, and so benefit together in the result.

As pointed out by the authors:

> The varieties of car wheels have been reduced from 175 to 4; malleable chains from 2044 to 820; clocks from 600 to 80; farm implements from 1092 to 37; hammers, axes, &c., from 2752 to 761; paper from 377 to 56; paving brick from 66 to 7; pipe fittings from 17,000 to 610; stove parts from 2982 to 364; toilet goods from 452 to 140.

This step alone would do wonders for British trade. In the gas industry we can all think of numbers of cases where bastard sizes are an absolute curse, and lead to the stocking of numerous small stores, and delays in dealing with consumers' and with works' breakdowns.

Standards for Silica Materials.

A case in point occurs to me in connection with the extending use of silica. Hundreds of different shapes are being ordered when comparatively few would suit the purpose, and every day these shapes are being increased in number. Anyone who is familiar with the process of silica brick manufacture knows that, to obtain good material at a reasonable price, it is of fundamental importance to cut-down the numbers of different shapes. Each new shape means an expensive mould in metal, or a metal lining in a wooden backing—and these are very expensive to make.

When a manufacturer receives an order for a new shape, it is a problem to know how best to make it and to stack it in the kiln, and a process of trial and error is frequently necessary before a satisfactory percentage of good shapes can be turned out.

With silica materials growing in popularity, it is undoubtedly of great importance to grapple with this problem, or we shall suffer seriously from its ill effects in years to come. As it appears to me, it is a case for the Institution of Gas Engineers to co-operate with the Society of British Gas Industries, and to arrive at standard sizes and shapes which ought to suit 95 p.ct. of the users. It would undoubtedly lead to better material and lower prices.

Chapter IV. is entitled "Rapid Turnover Needs Less Capital." Men of experience know that, as a general principle, a quick job is a cheap one. In this chapter the authors give as one instance the speed with which the American laundries do their work—as I have always appreciated during my travels in that country. It is always possible to have one's

laundry collected in the morning, and delivered again at 6 p.m. the same day. As a result, one can always travel very light in the States. The authors give this as an instance of large output from a given plant and invested capital.

The next subject discussed is that of "No Limit to a Man's Output." It is generally known that there is no restriction of output in the States, and this is a boon of incalculable value to the American manufacturer.

SINKING FUNDS FOR DEPRECIATION.

In this chapter the authors point out the invariable practice of American firms in providing for depreciation and obsolescence of plant in a way which is rarely done in England. By this means funds soon accumulate to purchase more modern plant; and this they do not hesitate to do. The American is always looking for a machine which will enable him to turn out more per man employed; and in spite of this, or rather, I consider, because of this, there is no unemployment in the country. By this means wages are increased—a man operating a larger or better machine receives, and, in fact, deserves, higher pay—and costs of manufacture are reduced. Thus this policy increases the spending power of the man and the sales of the firm.

We come next to "No Limit to Payment by Results," which is a fact, and needs no further comment here.

The authors then deal with the importance of free exchange of ideas between competing firms—a broad-minded policy which has worked very well in America. Ford has always thrown open his works to his competitors, and it certainly has not hurt him.

"Elimination of Waste" is the heading of Chapter VIII., though, in my opinion, we have little or nothing to learn from America in this respect; and the same applies to the next subject discussed, "Attention to Welfare." Many firms there are very go-ahead in this respect, but the same policy is followed by numerous enlightened employers in this country.

The "Importance of Research" is the next subject. No one with vision and a knowledge of industry will gainsay the importance of research. At the same time, if I were to make a special study of the importance of research work, I should go to Germany, and not to the United States, in which country I do not think there is any more time given to research than there is in England.

The authors quote Sir Charles Parsons as saying that, over and above keeping plant up-to-date, from 1 to 3 p.ct. of the capital must now be spent on experimental work if engineering firms are not to fall behind in the race. Presumably this is meant to be an annual expenditure. In comparison with this, how trifling appears the money devoted to research by the gas industry.

SIZE OF COAL WAGONS.

"Distribution" is the subject of the next chapter, and, as might be expected, the authors at once allude to the difference in size of the railway wagons used here and in the States. The British coal truck with a capacity of 8 to 10 tons compares very badly with the American trucks of 50 to 70 tons. These latter are bottom tipping, the whole load being released instantaneously. Coal handling plant is arranged to elevate the coal from a pit under the rails. In some cases these large coal trucks are designed to be emptied by grab. The size of truck must surely be an important factor in the cost of carrying coal in this country. We are sometimes told that there are insuperable difficulties in the way of adopting large wagons. The authors quote an eminent railway authority as stating that "the capacity of railway trucks in Great Britain could be increased to 30 tons without affecting railway platforms or any other limitations of the system."

The authors have interesting chapters on "Consumption and Saturation Point," and "Markets and Productivity."

The full significance of the increased spending power of the people, arising out of high wages, is pointed out by the authors; and there is, further, no doubt that the American Government protect their home trade much more carefully than we do. Accordingly a larger percentage of the earnings are spent in the country itself than is the case with us. In addition to this, the American is more inclined to buy an American-made article than a Britisher is to buy a British one. At the same time, I have always found that many American manufacturers show no special desire to sell their own goods outside America and Canada. This has always caused me some surprise. I think it is due to their considerable growth in home consumption, and that this provides as much as they can conveniently handle. American makers of plant and appliances for the gas industry evince no interest, so far as I have noticed, in the possibility of selling their goods in Europe.

The authors conclude with a chapter which reiterates the imperative need for industry in this country to take a different view of production, and for a much more enlightened co-operation on the part of masters and men for their and the public's mutual benefit. Who will deny that employers can do much more than they are doing to bring this about? The first move rests with them. The setting of a good example in efficiency and enterprise, and the placing of the cards fearlessly upon the table by the management, would be more likely to evoke a cordial response from the men than anything else which could be done.

GAS (AMENDING ORDERS) RULES, 1926.

The new Rules made by the Board of Trade with respect to applications for Amending Orders under section 1 (3) of the Gas Regulation Act, consequent on the increased cost of coal due to the stoppage in the coal industry, were reproduced on p. 188 of last week's "JOURNAL," and by this time will have been carefully studied by all whom they may concern. They set forth the method of application for a revision of the powers of charge in cases where the application is based upon the increased cost of coal, and require that the application shall be accompanied by a statement in duplicate setting out all matters relevant to it—including details of the alterations in the costs of the production and the supply of gas by the undertakers consequent on the increased cost of coal after making due allowance for increased prices of coke.

Wishful, as always, to assist the gas industry, the Board of Trade have prepared for circulation the following suggested

SUGGESTED FORM TO BE ATTACHED TO STATEMENT UNDER RULE 4 (*a*).

.....Undertaking.

—	1st to 30th April, 1926.	1st to 31st May, 1926.	1st to 30th June, 1926.	1st to 15th July, 1926.	16th to 31st July, 1926.	Further Periods of 15 Days to Date.
Gas made—						
Coal gas (1000 c.ft.)						
Water gas ,, ,,						
Total (1000 c.ft.)						
Gas sold (1000 c.ft.)						
Average calorific value						
Coal carbonized (tons)						
Coke and breeze made (total tons)						
Coke and breeze used for water gas (tons)						
Coke and breeze sold (tons)						
Average selling price of coke and breeze (tons)						

Price of Gas to ordinary consumers on 1st May, 1926.....pence per therm.

Subsequent changes (if any) on.....to.....pence per therm.

on.....to.....pence per therm.

	Tons.	Average Price per Ton.
Coal.		
In stock on 1st May, 1926		
Delivered to works since 1st May under old contracts		

Details of purchases (firm) since 1st May, 1926		British or Foreign.	Tons.	Price per Ton.
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			

Coke and Breeze in stock on 1st May, 1926,.....tons.

Signatures (1).....Chairman *or* Managing Director.

(2).....Secretary *or* Engineer.

.....Date.

form of arrangement of the desired information. It is not an essential and fundamental form, and it is not intended to bind undertakings down to strict adherence to it; but it embodies the kind of information which the Department feel it will be necessary to have before them when considering applications for price revision under these Rules. And, of course, the advantages all round of adopting a uniform style will be apparent.

In contradistinction to practice, under the Gas (Amending Orders) Rules, 1923, we understand that, in cases where the Board of Trade grant an increase in price, a

period will be specified over which the increased rate will hold good; and at the end of this time the charge will automatically revert to the figure existing when the Amending Order was made. This method will have the advantage of saving local authorities the expense of making application for a further Amending Order when, with the falling of the price of coal, gas manufacturing costs are reduced. As to what this time will be, we have no definite information; but we fancy the period which the Board of Trade have under consideration is one which will give the gas undertaking a full half-year's working after the stoppage in the coal fields has come to an end. Take the case of a company whose accounts are made up to Dec. 31. If the strike should end (say) this month, the increased price for such an undertaking would remain operative until June 30, 1927. Should the strike not have terminated before the end of September, then a company making up their accounts to Sept. 30 would work at the increased charge for gas until Sept. 30 next year.

Another point. Under the Amending Order Rules of 1923 August was a "dead month" so far as calculating the period for lodging objections was concerned. In the case of the new rules, August will rank the same as any other month. Moreover, the period for lodging objections is to be cut-down from twenty-one days to ten days.

For this effort to speed-up things, and to ease a difficult path, the gas industry will be grateful, particularly those of the smaller undertakings which may be most "feeling the pinch" of a state of affairs by which all are made to suffer. Also the local authorities will appreciate the saving of money and of trouble which the new procedure spells.

HIGH CALORIFIC VALUE GAS FROM VERTICAL RETORTS.*

A Report of the Fuel Research Board.

The Department of Scientific and Industrial Research have published Fuel Research Technical Paper No. 15, which deals with the production of coal gas of a high calorific value from the carbonization of Holmside (Durham) coal in Glover-West verticals. The investigation described in the report, and carried out at H.M. Fuel Research Station, was the outcome of a request from the South Metropolitan Gas Company. The object was to ascertain the possibility of producing, in continuous vertical retorts, gas and coke of the same nature as the Company were obtaining in their intermittent inclines at the Bankside Station. A Durham coal, known as "Holmside," was selected, and a cargo of 1000 tons was set aside for the tests. From this coal the Company obtain gas having a calorific value of 560 B.Th.U. per c.ft., and a coke containing not more than 3 p.ct. of volatiles.

—	Vertical Retorts at Fuel Research Station. 4·2 P.Ct. Steam.			Inclined Retorts at S.M.G. Company's Bankside Station.
	Test 1.	Test 2.	Test 3.	
Conditions	Short Plate, Wet Main.	Long Plate, Wet Main.	Long Plate, Dry Main.	
Carbonizing temperature—				
Mean of combustion chambers, ° C.	1,169	1,187	1,201	1,272
Number of retorts in use	4	4	4	72
Coal—				
Total carbonized, tons	50·02	20·26	50·41	889
Charged per retort per day, tons	2·50	2·51	2·52	1·11
Time of carbonization, hr.	..	..	..	9
Intervals between charging, min.	..	..	..	25
Gas—				
Yield per ton of coal, c.ft.	11,880	11,380	11,750	12,157
" " " therms	65·8	64·1	66·7	68·4
Calorific value, B.Th.U. per c.ft., gross	554	563	568	562·6
Specific gravity (air = 1)	0·384	0·379	0·379	0·422
Inerts, p.ct.	7·5	6·2	10·4	9·9
Coke—				
Yield per ton of coal, cwt.	14·66	14·74	14·87	14·84
Breeze (passing ¾-in. sieve), p.ct.	12·0	10·7	9·9	5·8
* Volatile matter (less moisture), p.ct.	3·30	3·89	3·60	2·66
Ash, p.ct.	10·16	9·01	9·37	10·63
Tar (dry)—				
Yield per ton of coal, gal.	8·89	8·45	8·40	15·05†
Specific gravity at 15° C.	1 129	1·151	1·159	1·054
Liquor—				
Yield per ton of coal, excluding water to scrubbers, gal.	14·2	16·4	16·1	7·7†
Ammonium sulphate (pure)—				
Yield per ton of coal (total available), lbs.	20·09	22·51	21·59	17·59†

* Determined by the crucible method.
† Some uncertainty exists as to these figures, owing to difficulties in stocktaking.

After various experiments, it was found that the following alterations to the Station setting of four Glover-West vertical retorts gave the best results:

(1) Lowering the temperature at the top of the retort, and maintaining a rising temperature gradient from top to bottom.

(2) The position of the steam inlets was lowered from near the top of the coke chamber to just above the door casting. This caused more efficient quenching of the coke, and at the same time reduced the quantity of steam actually passing up the retort. This had a marked effect in increasing the calorific value of the gas, but it was still found impossible to ensure the desired calorific value together with a low volatile content in the coke.

(3) The baffle plate between the coal inlet and the gas off-take was increased in length from 10 in. to 40 in., to increase the length of hot brickwork to which the gas was exposed on leaving the retort. This increased the cracking of tar vapours, and again raised the calorific value.

(4) The collecting main was run dry, instead of with tar circulation as usual. This again raised the calorific value of the gas by avoiding the scrubbing action of the circulating tar.

As a result of (2) and (3) it was possible to use higher temperatures towards the bottom of the retort, and so to increase the yield of gas, and reduce the volatiles in the coke, while still maintaining the desired calorific value of the gas.

The preceding table gives the main results of the investigation.

The only real difference in the coal treated is that the mean ash in the Gas Company's average was 1 p.ct. less; and this, it is stated in the report, should, theoretically, be indicated by gas yields 1 p.ct. higher. The actual increase was of the order of 3·5 p.ct. by volume and therms, and the additional yield over 1 p.ct. was evidently obtained by more complete exhaustion of the coke.

The compositions of the gases obtained were fairly similar. It should be noted that the specific gravity of the vertical retort gas is substantially lower than that of gas from the inclined retorts.

In addition to this special investigation, a set of three tests (five days each) was carried out on the same coal, and with varying amounts of steaming. These tests were carried out under the standard conditions adopted in earlier investigations, and form the second part of the investigation. The results are strictly comparable with those of previous investigations.

The main details of the carbonizing tests are set out in the following table:

Test No.	4.	5.	6.
Duration of test, hours	120	120	120
Pressure in collecting main, in. water	0·0	0·0	0·0
Temperature of combustion chambers (mean) ° C.	1,257	1,257	1,257
Result of weight balance, loss p.ct.	1·62	2·75	2·70
Coal—			
Total carbonized, tons	50·32	50·15	50·21
Charged per retort per day, tons	2·52	2 51	2·51
Moisture as charged, p.ct.	0·89	0·95	1·10
Steam—			
Total to retorts by direct weighing, tons	2·54	6·29	10·15
Percentage by weight of coal.	5·05	12·54	20·21
Pressure at boiler, lbs. per sq. in.	50	65	65
Pressure at diaphragm, lbs. per sq. in.	16	19	21·5
Gas—			
Total made at 60° Fahr. and 30 in. saturated, c.ft.	664,110	724,090	800,640
Yield per ton of coal, c.ft.	13,200	14,400	15,940
" " " " therms.	69·17	72·78	76·51
Calorific value per c.ft. gross, B.Th.U.	524	504	480
Specific gravity (air = 1)	0·385	0·390	0·412
Inerts, p.ct.	9·05	8·40	11·25
Coke—			
Total made, tons	37·19	36·49	36·38
Yield per ton of coal, cwt.	14·78	14·55	14·49
Breeze passing ¾-in. sieve, p.ct.	9·6	8·9	9·5
Volatile matter less moisture (in nitrogen), p.ct.	1·24	1 35	1·34
Ash, p.ct.	9·18	9·62	10 18
Tar—			
Total dry tar made, gal.	481·0	482·3	469·5
Yield per ton of coal, gal.	9·58	9·62	9·52
Specific gravity at 15° C.	1·162	1 150	1·162
Liquor—			
Water to scrubbers per ton of coal, gal.	5·04	5·32	*Nil*
Total liquor collected, gal.	20·25	32·38	37·82
Strength of liquor, oz.	10·1	7·5	6·1
Ammonium sulphate (pure)—			
In liquor per ton of coal, lbs.	17·25	20·50	19·55
Escaping in gas per ton of coal, lbs.	1·21	0·92	1·79
Fuel gas per setting—			
Total fuel gas consumed per hour, c.ft.	5,207	5,403	5,690
" " " " " therms	15·20	15·94	16·79
Calorific value per c.ft. (gross), B.Th.U.	292	295	295

* Fuel Research Board Technical Paper No. 15. "Carbonization of Coal in Continuous Vertical Retorts—'Holmside' (Durham) Coal, with Experiments on the Production of Coal Gas of High Calorific Value." Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. 3d. net.

INSTITUTION OF FUEL TECHNOLOGY.

First Officers and Council.

In the early part of last March, a meeting was held (as reported in the "JOURNAL" at the time) at the Institution of Civil Engineers, Great George Street, S.W., with the object of discussing the founding of an Institution of Fuel Technology. It was explained then that, when the proposal was first made to a few people interested in fuel, it became evident that there was a widespread desire for an organization of the kind proposed, for the purpose of co-ordinating the practice and the science of the efficient utilization and production of fuel generally. The meeting expressed the opinion that such an Institution should be formed, and an Organizing Committee were appointed "to determine the general basis of organization and to define more specifically the object of the work of the proposed Institution." The Committee were requested to prepare a report, and make recommendations; and they promptly set to work, in consultation with Mr. T. Trimnell (the Hon. Legal Adviser), on the drafting of a Memorandum and Articles of Association.

These, with the Committee's nominations for the various offices and the first Council, were submitted to a second meeting, which took place on Friday last, July 30, at the same place, under the Chairmanship of Sir WILLIAM J. LARKE, K.B.E.

THE FIRST PRESIDENT.

The CHAIRMAN, at the opening of the proceedings, read the following letter from the Right Hon. Sir Alfred M. Mond, Bart., who has consented to be the first President of the new Institution:

> I regret very much that I cannot attend the meeting of the Institution of Fuel Technology to-morrow. Unfortunately, I have to leave London for the country this afternoon [July 29]. I am all the more sorry, as it is the first meeting which I can attend as the President of the Institution.
>
> The work which the Institution has set itself to do is of the utmost importance to industry, and, indeed, to the whole commonwealth. Under the conditions in which the country has been existing during the last few months, public interest has become more and more concentrated on the problems which the Institution has been formed to solve.
>
> I hope that the meeting will be a great success and that the Institution has a long and useful life before it.
>
> Yours sincerely,
>
> (Signed) ALFRED MOND.

The CHAIRMAN then went on to explain that the meeting had, from unavoidable causes, been somewhat delayed. In the meantime the Organizing Committee had received a very large number of letters, expressing cordial good wishes for the success of the Institution, and promising support to the movement. Upwards of 150 founder members' forms had already been completed and sent in, and they were still coming along freely. The keynote of the whole movement, so far as the relationship with other organizations was concerned, had been co-operation, and not competition. A suggestion had been made that the new Institution and the Institution of Fuel Economy Engineers should combine if possible. Correspondence had been exchanged, and a long conference held between representatives of the Fuel Economy Engineers and members of the Organizing Committee, to ascertain whether it was possible to combine the two movements. While both parties made every effort to find common ground for joint action, and the meetings were of the frankest and friendliest character, the Institution of Fuel Economy Engineers stipulated that the basis of membership should be some technical or professional qualification, so that membership of the Institution should confer a status; and they requested that this Institution should at least provide one class of definitely qualified members. The Organizing Committee felt that this was a fundamental difference, and contrary to the sense of the inaugural meeting, and that it would limit the sphere of usefulness of the new Institution. The basis of this movement was that it should be national in character, and secure the support and co-operation of all interested in fuel and fuel problems. To secure this end, the Iron and Steel Institute, which required no technical qualification, was accepted as a model for the basis of membership.

The Chairman said it could not be too strongly emphasized that the objects of the Institution were to promote, foster, and develop the general advancement of the various branches of fuel technology as an end in itself. To do that, it was considered desirable to enlist the support of all those having any interest in fuel, and not to limit membership by any restrictions as to technical or professional qualifications, but to maintain the prestige and standing of the Institution by the character and nature of the papers presented under its auspices, and by the election of a strong Council representative of all interests within the scope of the Institution. The constitution had been so designed as to secure facilities for co-operation with all existing Institutions having fuel interests. The Council were empowered to invite such Institutions to nominate one member on the Council of this Institution. It had been proved conclusively that there was need for an Institution which would bring all sections of workers in fuel and fuel problems into a closer relationship.

He felt that they were that day laying the foundation of a very important organization under conditions of such widespread and influential support as should secure for it the power to exercise a far-reaching influence on national economy. It was in a spirit of co-operation with all existing Institutions having fuel interests that this new Institution hoped and desired to work.

It was unanimously agreed that the name of the new organization should be the Institution of Fuel Technology.

Mr. LEONARD C. HARVEY, in moving this, said that in the interests of the country a National Fuel Institution must be one of the most important. The very existence of the country was based on fuel.

Mr. S. H. NORTH, who seconded, remarked that an Institution without membership qualification which had attracted such men as were to be found in the Iron and Steel Institute was a sufficient reply to anyone who desired to have a qualification for membership in the case of the new Institution. There were too many interests in the fuel question. What they wanted was concentration, and not segregation. They needed one Institution which could deal with every aspect of the fuel question—the greatest national problem of the day.

MEMORANDUM AND ARTICLES ADOPTED.

Sir RICHARD REDMAYNE said they owed a great debt of gratitude to the Organizing Committee and their legal adviser, for the extraordinary care with which the Memorandum and Articles of Association had been drafted. There might be among those present some who would like to criticize certain of the Articles, because there was a type of individual to whom criticism came naturally; but he would beg of such not to do so that afternoon. He would suggest that they should unanimously agree to the resolution he had to propose—namely, "That the Memorandum and Articles of Association presented to this meeting by the Organizing Committee be and are hereby adopted as the constitution for the Institution of Fuel Technology"—and then wait for the result of experience to see whether or not the articles could usefully be amended in any direction. With regard to those interests which might not be specifically represented on the governing body as at present proposed, he drew attention to one of the Articles, under which the Council as constituted would be able to secure representation of any such interests. This at once removed any possible cause of complaint that might have existed in any of the other great Institutions. The field was so immense that the more the workers the better would be the harvest. He foresaw for the Institution perhaps one of the greatest fields of usefulness of any of the Technical Societies in Great Britain to-day. Cheap fuel, in whatever form it might be, was the basis of the supremacy of the country.

The motion was briefly seconded by Mr. W. A. WOODESON, and agreed to.

OFFICERS AND COUNCIL.

Mr. F. W. HARBORD, moving that the nominations made by the Organizing Committee for the first officers and Council of the Institution be adopted, expressed the opinion that the Committee were to be congratulated upon having secured so distinguished a body of men to act as President, Vice-Presidents, and members of Council. Referring to them individually, he said that Mr. Milne Watson had probably had a larger experience on both the technical and business sides of the gas industry than anybody in this country. In addition, they had, as another Vice-President, Prof. Harold B. Dixon, who represented research on the scientific side. On the Council, too, their interests would be cared for by men to whom economy of fuel in industry was one of the most serious problems with which they had to deal.

Sir WILLIAM SMITH, in seconding, remarked that the new Society was fortunate in that it was to be carried on under such eminent auspices. Most of those present were connected with the industrial side of the question; but there was another important side—public health—which he hoped would not be lost sight of.

The list of names, which was as follows, was then unanimously adopted:

President.

Rt. Hon. Sir ALFRED MORITZ MOND, Bart., P.C., M.A., M.P., 35, Lowndes Square, S.W. 1.

Vice-Presidents.

Right Hon. Lord ABERCONWAY, P.C., K.C., M.A., 43, Belgrave Square, S.W. 1.

Prof. HAROLD BAILY DIXON, C.B.E., M.A., Ph.D., F.R.S., The University, Manchester.

Sir ROBERT ABBOTT HADFIELD, Bart., D.Sc., D.Met., F.R.S., 22, Carlton House Terrace, S.W. 1.

Rt. Hon. Lord WEIR, P.C., D.L., 2, Adelphi Terrace, Strand, W.C. 2.
Mr. D. MILNE WATSON, M.A., LL.B., D.L., 73, Eccleston Square, S.W. 1.

Members of Council.

Mr. R. A. BURROWS, "Woodlands," Atherton, Manchester.
Sir PHILIP DAWSON, M.A., M.Inst.C.E., M.P., "Maybourne," Sydenham, S.E. 26.
Mr. F. A. FREETH, O.B.E., F.R.S., D.Sc., Ph.D., F.I.C., Heather Croft, Hartford, Cheshire.
Sir W. J. LARKE, K.B.E., Caxton House (East), Tothill Street, S.W. 1.
Mr. RUDOLPH LESSING, Ph.D., F.C.S., M.I.Min.E., M.Inst.P.T., Southampton House, 317, High Holborn, W.C. 1.
Mr. M. MANNABERG, 48, Hans Mansions, S.W. 3.
Sir EDWARD MANVILLE, M.P., 3, Whitehall Court, S.W. 1.
Mr. S. MCEWEN, Aldwych House, W.C. 2.
Rt. Hon. Lord MONTAGU OF BEAULIEU, K.C.I.E., D.L., 62, Pall Mall, S.W. 1.
Sir RICHARD REDMAYNE, K.C.B., F.G.S., 34, Victoria Street, S.W. 1.
Admiral Sir EDMUND SLADE, K.C.I.E., M.V.O., 63, Bedford Gardens, Campden Hill, W. 8.
Mr. WALLACE THORNEYCROFT, Plean House, Plean, Stirling.
Mr. M. W. TRAVERS, D.Sc., F.R.S., 147, Queen Victoria Street, E.C. 4.
Prof. R. V. WHEELER, D.Sc., F.I.C., F.G.S., F.C.S., University of Sheffield, St. George's Square, Sheffield.
Mr. W. A. WOODESON, Victoria Works, Gateshead-on-Tyne.
Mr. T. HARDIE, Gas Light and Coke Company, Horseferry Road, S.W. 1.
Mr. A. H. MIDDLETON, Consett Iron Company, Ltd., Consett, Co. Durham.
Mr. G. R. THURSFIELD, Sturtevant Engineering Company, Ltd., 147, Queen Victoria Street, E.C. 4.
Mr. W. M. SELVEY, 64, Victoria Street, S.W. 1.

Hon. Treasurer.

Sir WILLIAM B. PEAT, C.V.O., 11, Ironmonger Lane, E.C. 2.

Hon. Secretary.

Mr. EDGAR C. EVANS, B.Sc., F.I.C., Caxton House (East), Tothill Street, S.W. 1.

The CHAIRMAN announced that some important papers had been promised for the next meeting. The time and place of this were left to the Council to determine, on the motion of Mr. W. M. SELVEY, seconded by Mr. H. M. RIDGE, who expressed the view that the Fuel Section of the Society of Chemical Industry would be very pleased to co-operate with the new Institution.

Dr. M. W. TRAVERS, proposing a hearty vote of thanks to the Chairman, declared that Sir William Larke had been the very spirit of co-operation. In connection with the work of the Organizing Committee, the aim had been to bring everybody together.

The CHAIRMAN, in response, said it had been to him both a pleasure and a privilege to do what he could in a matter which he conceived to be in the highest national interest.

Computing Natural Gas Leakages.

A United States Bureau of Mines abstract, reproduced in the "Journal of the Franklin Institute," of a communication by Messrs. E. L. Rawlins and E. O. Bennett, on "Computing the Rate of Leakage from Natural Gas Lines," states that various methods of making leakage tests have been tried during a study of losses in the transmission of natural gas. This work has been carried on by the Bureau of Mines in co-operation with the Natural Gas Association of America. Results of tests show that the "shut-in pressure-drop" method is the most accurate and reliable; and therefore its use is recommended. The gas is "shut in" the main to be tested, and is not allowed to escape except through existing leaks. The leakage causes the pressure in the main to fall. The change in pressure is obtained with a dead-weight gauge; but approximate results may also be obtained from readings on a good spring test gauge. Numerous tests show that the dead-weight gauge is more sensitive to small pressure changes than are spring gauges. The temperature of the gas in the main is observed simultaneously with each pressure reading. Temperature changes affect the pressure exerted by a given quantity of gas "shut in" a main, and since the rate of leakage from a closed system is directly proportional to the rate of pressure drop, fluctuations in temperature must be considered. Two nomographic charts have been prepared, which are arranged to give the leakage rate of gas from mains of various sizes.

Natural Gas Discovery.—It has been found that a borehole at Devon, in the Orange Free State, yields a steady flow of natural gas. A financial company has covered the top of the shaft, and a movement is projected to sink more shafts. Mining engineers believe that the gas indicates a rich oil deposit.

Preparing for the Dark Season.—The current issue (No. 149) of "A Thousand-and-One Uses for Gas" contains just those practical suggestions on shop lighting which the small or the medium shopkeeper requires. It is published at an opportune moment, for during the summer months the planning and carrying out of a lighting scheme can be done with a minimum of inconvenience to the shopkeepers and their customers.

Determination of Traces of Carbon Monoxide.—Messrs. Radiation Limited have reprinted in booklet form the paper on this subject which was published in the "JOURNAL" for June 9, p. 530. The paper embodies the results of investigation by the Research Staff (Messrs. Hamilton Davies, B.Sc., and Harold Hartley, D.Sc.) of the firm. Copies of the reprint may be obtained from the Research Laboratories of Messrs. Radiation.

British Standard Specifications for Asbestine, Zinc Oxide, and Varnishes.—The British Engineering Standards Association have issued British Standard Specifications for zinc oxide (types 1 and 2) for paints, asbestine for paints, interior oil varnish, exterior oil varnish, and flatting or rubbing oil varnish. They contain clauses regulating the composition, together with standard reception tests, for the purchase of these materials. Copies of these five new specifications (Nos. 254, 255, 256, 257, and 258—1926) can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, S.W. 1; price 1s. 2d. each, post free.

Heating of Insulated Houses.

A seven-roomed house automatically heated by a gas boiler last winter, at a cost lower than coal, proved a great attraction to Chicago people, according to the "American Gas Journal." The house, which is located in one of Chicago's forest preserves, where temperatures are several degrees lower than in the crowded city streets, is insulated with patented material, which is said to account for the economy in the heating bill. The insulating material comes in bags, like cement, and is mixed with water. It is poured down inside the walls, and allowed to set. It hardens into a porous and spongelike mass, filled with millions of tiny air cells. The outside walls are covered with sheathing and shingles; while the inside walls are covered with a gypsum wallboard. The space between the roof rafters is insulated the same as the side walls. There are 2 in. of insulation beneath the lower floor to keep the floor warm and the basement cool. The insulation proved so successful that snow remained on the roof for days, until melted by the sun, while the roofs of nearby houses were cleared by the heat leakage. Under these conditions an insulated house will more than pay the cost of insulation through fuel saved in the first three years, say the United States Bureau of Industrial Research.

National Coal Products, Chemical and Engineering Exhibition.—We are informed that the interest taken by the various trades concerned in this exhibition (which is to be held in Manchester from Nov. 16 to Nov. 27) is most gratifying, and that the success of the exhibition is already assured. Among those giving their support are the Institution of Gas Engineers, the Fuel Section of the Society of Chemical Industry, and the Coke Oven Managers' Association. With the co-operation of such organizations as these, and as trade buyers from a wide area will receive special invitations with complimentary tickets, the exhibition offers an excellent opportunity of coming into personal contact with a large number of potential customers.

Safety in Gas Equipment.—Acting upon the advice of their Appliance Certification Committee, the Pacific Coast Gas Association have issued the following warnings: Accessory attachments which in any way affect the supply of gas to a flame, the size or shape of a flame, the air supplied to a flame, the escape of products of combustion from a flame, or the relative position of the burner and utensil or object to be heated, including those devices commonly described and sold as "gas savers," are seldom conducive to economy in the use of gas, and are so frequently dangerous to the user by interfering with the proper functioning of the gas appliance as to warrant fully a withholding of approval for any such contrivance, unless passed by the laboratory of the American Gas Association or by the manufacturer of the gas appliance upon which the attachment is to be used. Particularly dangerous and reprehensible is the practice of installing water coils in the flames of gas appliances—such as an open top range or any other apparatus not primarily made for water heating—from which the products of combustion may enter the room. In these cases, dangerous quantities of carbon monoxide may result from incomplete combustion of gas.

CORROSION.

Discussion at the Congress of Chemists.

On Tuesday, July 20, a symposium was held under the auspices of the British Chemical Plant Manufacturers' Association, the Institute of Metals, the Institution of Chemical Engineers, and the Chemical Engineering Group of the Society of Chemical Industry. Dr. R. SELIGMAN (Chairman of the British Chemical Plant Manufacturers' Association) presided.

FUNDAMENTAL PRINCIPLES.

The first paper to be submitted was by Mr. U. R. EVANS, who dealt with the fundamental principles of corrosion. In this the author remarked that at one time it was thought that the electric currents which caused corrosion on steel flowed between the carbide particles as cathodes and the iron grains as anodes. Recent researches have, however, shown that the sizes of the anodic and cathodic zones on specimens undergoing corrosion greatly exceed the dimensions of the grains, and that the important corrosion is due to currents set up by variations in oxygen-concentration in the liquid. Experiments have shown that the places where the oxygen-concentration is least are anodic and suffer corrosion. Thus, although oxygen is needed for the action, the attack occurs at places to which oxygen has no direct access.

At chemical works, liquids are frequently handled which would attack most metals even in the absence of oxygen. Questions frequently arise as to the choice of materials for treating, conveying, or storing these liquids. The use of a "noble" metal which is, *per se*, resistant to corrosion, is limited on account of cost, although platinum, gold, silver, and alloys containing these metals, have all been used for special purposes. Copper stands on the boundary of the "noble class," and is used considerably for some purposes; but it is by no means proof against corrosion. In fact, towards alkalis, it is far less resistant than iron. For most purposes, we must employ a material which can protect itself against corrosion, either because it yields an insoluble body as the primary corrosion product, or because it becomes covered with a protective film in the presence of oxygen.

Concluding, he said that any review covering the trend of opinion on the subject of corrosion during the last few years must lay stress on two features. First, there has been an increasing appreciation of the importance of protective films in controlling the extent and distribution of attack on metals. The electro-chemical mechanism of most corrosion-processes can itself be regarded largely as the effect of protective-film action, since direct chemical action is only possible in the comparatively rare instances where this does not lead to the formation of a protective layer. Secondly, whereas formerly electro-chemical corrosion-currents were thought to be set up by differences in the metal, it is now realized that they are more often set up by differences in the liquid at different parts of the surface, and particularly by differences of oxygen-concentration, which will cause attack at the more inaccessible points of the surface. It is not denied that chemical or physical differences between various parts of the metal, also, can produce corrosion-currents. This, indeed, is an important cause of corrosion in some cases, notably when parts of the surface are covered with mill-scale, or where two dissimilar metals are in contact, or where segregation exists in the material; nor is the E.M.F. set up between destressed and unstressed parts of the metal a matter to be neglected. Nevertheless, the author believes that some of the instances which in the past have been attributed to such causes would have been more correctly explained in other ways. For instance, in some cases where marked corrosion has been experienced at the union between two pieces of metal, the attack was probably not mainly due to an E.M.F. set up by the contact of dissimilar materials, or to contact between metal and the oxide produced in welding; rather it is to be ascribed to the crevice between the two pieces, which formed a point inaccessible to oxygen, suited to act as an anodic area. Likewise, it seems possible that some of the cases of local attack produced by deformation have been due to the opening of pores by the bending rather than to E.M.F.'s attributable directly to the stress.

CORROSION OF CENTRIFUGAL BASKETS.

Then Mr. P. PARRISH, A.I.C., M.I.Chem.E., of the South Metropolitan Gas Company, contributed a paper on the corrosion and erosion of centrifugal baskets, spindles, &c. Having contrasted the conditions of sulphate of ammonia manufacture ten years ago with those existing to-day, he remarked that, with the introduction of washing and other such processes for the production of neutral dry sulphate of ammonia, involving the neutralization of the acid-containing salt within the centrifugal basket, the corrosion problem became somewhat acute. It affected, and still affects, a large number of works. Though there may be disadvantages attending the use of a weak solution of ammonia, variously obtained, as a washing medium for the neutralization of acid-containing sulphate of ammonia, or the employment of the centrifugal basket as the apparatus within which this operation is effected, there is much to be said in favour of the adoption of these practices. Apart from neutralization, a washing process has undoubted advantages in its effect on the sulphate. If neutralization is not effected in the centrifugal basket, it must be carried out in some kind of apparatus, where the possibilities of corrosion may be equally as great. But basket corrosion is not confined to washing processes. It occurs when ammonium carbonate is decomposed within the mass of the acid-containing sulphate, and gaseous ammonia is diffused through the salt bed in the centrifugal.

The author said that experience suggests that the resistant properties of phosphor bronze are at times sacrificed for tensile strength. What is required is a metal having a high tensile strength and satisfactory resistant properties. Regarding the working of centrifugals, the maximum permissible speed and load of these machines, which should be obtained from the makers at the time of purchase, must never be exceeded. With direct steam-engine driven machines the steam supply must be furnished with suitable reducing and relief valves to ensure that the permissible steam pressure cannot be exceeded. Examinations of machines at regular intervals must be made, and reports on their condition furnished to the engineer in charge. Machines handling acid or other corrosive substances require extremely careful inspection. In order to ascertain the extent of the corrosion over regular periods, the basket, when taken out for inspection, should be washed thoroughly clean, dried, and then weighed; the loss in weight affording the best indication of the extent of the wear which has taken place. In the execution of repairs to the basket, the greatest care is necessary to ensure an even distribution of weight.

It has occasionally been urged that gauzes, which corrode rapidly, should be dispensed with, and the perforations of the basket made such that there is maximum retention of the salt introduced with the magma. In this connection, it is often overlooked that once the holes have enlarged in the shell plate, its intrinsic value for effecting separation of salt from mother liquor has ceased. Where a gauze is used, a certain enlargement of the holes of the shell plates can, with impunity, be permitted.

To ensure a full lease of life of a phosphor-bronze spindle, it has been found necessary to skim off the corroded part in a lathe, and to use bushes which are driven tight on the machined parts, and suitably pegged. A spindle will deal with at least 6500 tons of ammonium sulphate when sheathed from time to time in the manner described. The expenditure on ejectors is not excessive; but as corrosion occurs, it is desirable to say a few words on the subject. It has been found that a lead sheathing, suitably attached to the outside portion of the lifter, and extending a foot above and below the wind and water line, is a provision which adds materially to the life of the 3-in. tube. Corrosion at one or two works where investigations have been made suggests that the escape of ammonia with the waste gases, due either to accumulations of rock salt in the saturator, or to the absence of careful control of the acidity, leading to local alkalinity, has very sensibly facilitated corrosion of the ejector.

Copper gauzes lead to the coloration of the salt immediately adjacent to them. At some works, various qualities of steel gauzes have been used. Not only do they prove to be less expensive than either copper or Monel metal gauzes, but they overcome the difficulty of the blue coloration on the salt bed, which is so pronounced when copper gauzes are employed. It is wrong in principle, from an electro-chemical point of view, to employ dissimilar metals—*e.g.*, steel gauze with a phosphor bronze basket—because the electrical potentials of the respective metals are different. In practice this has been found to be a very minor factor, which can be largely ignored.

The use of coconut matting, jute canvas, or cotton filter cloth has been recommended. These linings may prove satisfactory for small works, but it is certain that they are a source of inconvenience at large works, where the centrifugals are kept almost continuously at work. Metallic gauzes at many works suffer attrition as a result of the use of steel shovels. If these were dispensed with, and wooden spades employed for discharging the sulphate from the centrifugal baskets, considerable economy would accrue. Probably the gauze suffers as much from attrition as from corrosion.

Mr. Parrish states that there can be no doubt that rolled Monel metal affords a solution to the problem of the corrosion and erosion of centrifugal baskets and other accessories, with which gas engineers, coke-oven managers, and chemical manufacturers have been obsessed for several years now.

The author estimates that at least £40,000 is spent annually in this country on the provision of centrifugal equipment in the manufacture of bye-product ammonium sulphate. What is necessary in this matter is concerted action. A centrifuge of standard size, with a standard spindle, and a standard valve, should be adopted as far as possible. This would facilitate the making of the component parts, it would dispense with the multiplicity of "blocks," or "presses," or spinning devices, and it would lead to mass production of the component parts,

which alone can ensure the provision of the necessary equipment at a reasonable price.

PURE LEAD NEEDED.

In a further contribution on the corrosion and erosion of chemical sheet lead, Mr. Parrish said that large quantities of this material are used in the construction of sulphuric acid chambers and ammonium sulphate saturators. For both purposes purity is of vital importance. Pattisonian refined chemical sheet lead is to be preferred to that manufactured by the Parkes process. Practical trials, where a certain number of Pattisonian refined sheets constituted one side of a chamber, and where a similar number refined by the Parkes process formed part of the other, have revealed that the loss has been 6 to 10 lbs. of lead per ton per annum in the case of the former, while 15 to 20 lbs. per ton per annum represents the loss with lead refined by the Parkes process.

It is known that opinions differ about the importance of purity of chemical sheet lead. Some affirm, with the writer, that purity is of vital importance; others hold the view that small quantities of antimony and copper improve its resistant properties. One suspects that the results of flash tests of chemical sheet lead have influenced certain chemical engineers to favour the introduction of small quantities of copper. Too much importance appears to be attached to the decomposition temperature of chemical sheet lead. This test is certainly important where the lead has to be used for sulphuric acid concentration pans (a rare requirement in these days), or for the dish or saucer of a Glover tower. But it is less significant where it is proposed to use the lead for the side of a Glover or Gay Lussac tower, or for the construction of sulphuric acid chambers or ammonium sulphate saturators.

What bearing has the incipient attack on chemical sheet lead by sulphuric acid at temperatures over 200° C., when the chemical sheet lead is to be used for purposes where the temperature rarely, if ever, exceeds 110° C.? If more attention were given to purity, and less to the flash test, an improved quality of lead would conceivably be obtained. What chemical engineers must know initially is the content of lead in the sheet lead. This should not be less than 99·99 p.ct.

The wisdom of adopting a specification where the lead content is dependent to an extent on the content of copper present is open to question. Particularly is this the case when the chemical sheet lead is intended for sulphuric acid chambers, and for sulphate of ammonia saturators. Many chemical engineers object to the presence of so small a quantity as 0·05 p.ct. of copper, when the chemical sheet lead is to be used for the construction of ammonium sulphate saturators.

Anyone who is familiar with the heterogeneity of structure and properties caused by the presence of impurities, or by changes during solidification, mechanical treatment, or effects of heat, must deprecate the presence of impurities, whether deliberately added in small quantities, or otherwise.

An attempt should be made to standardize practice at works manufacturing chemical sheet lead. Is virgin pig always used when chemical sheet lead is being prepared? Does re-melted pig lead, which may contain varying amounts of "Regulus" metal and other impurities, never find its way to the melting pot? Again, having ensured the very finest quality of pig lead, attention should be given to the method of melting it in the pot. To what temperature should the lead be raised? Should the metal be agitated at a specific temperature, and special arrangements adopted for removing the impurities? How many skimmings should be made? In this connection it should be remarked that the presence of oxides which may become rolled into the sheet causes local corrosion. It has been suggested that the effect of sodium, the use of which in minute quantities has been recommended, is to reduce the quantities of oxide present.

What test should be applied to determine when the metal is in a suitable condition, chemically and physically, to be tapped to the casting plate? If the molten metal is run to the casting plate at too high a temperature, a loose crystalline structure will be given to the metal, thus resulting in leakage; if the block is cast at too low a temperature, there is a possibility of the lead setting in layers, and the sheets possessing a laminated structure.

At what temperature should the block be lifted? Have any specific pressure and temperature yet been decided upon as the best for rolling? Does an excessive pressure produce a surface which is more readily susceptible to attack? Are the best sheets of lead obtained when the block of lead has a specific temperature? All the last-named factors have an important bearing on the physical character of chemical sheet lead; and it is felt that sample sheets, prepared under well-defined conditions, and put to practical trials at chemical works for certain specific purposes, would add materially to our knowledge. There should be a definite attempt to correlate the results of such tests.

Where tests are applied to determine the suitability of chemical sheet lead for certain purposes, it is important that they should be comparable with the practical conditions which obtain. It is far better to apply an exposure test in one or more acid chambers, and to determine the loss per unit area exposed, over a given period, than to adopt (say) a nitrosyl-sulphuric acid, aqua regia, or other such test.

In this connection it should be remarked that lead sulphate has a very important protective influence on chemical sheet lead. Below are results from pieces of lead which were suspended from a glass rod in the last chamber of a sulphuric acid plant for a period of one day, and for further periods.

—	1 Day Period.		1 + 6 Day Period.	
	10 Lbs.	20 Lbs.	10 Lbs.	20 Lbs.
Surface area	65·17	67·53	65·17	67·53 sq. cm.
Original weight of piece	148·085	253·625	148·086	253·625 grms.
Final weight at end of test period	148·027	253·552	147·235	252·550 grms.
Loss in weight	0·059	0·073	0·851	0·125 grms.
Loss in mg. per sq. cm. during test period	0·90	1·08	13·00	1·85 Mg.
Average do. per day	0·90	1·08	1·86	0·264 Mg.

The foregoing tests are particularly interesting in that the chamber gases practically ceased to have any action after the first day's exposure. This immunity from attack obtained not only over a subsequent 6-day period, but over several weeks. It is a phenomenon which has been observed in connection with many qualities of chemical sheet lead, and it is one which is not likely to be revealed by tests such as the nitrosyl-sulphuric acid or aqua regia tests.

Ammonium sulphate saturators suffer loss of weight more from erosion than from corrosion. It is important that there should be a well-defined agitation in the saturator. The velocity of the gases through the cracker, or distribution, pipes should be such that deposition of sulphate of ammonia is avoided. But this velocity should not be such that the crystal structure is impaired. Some continental works line their saturators with special tiles, with a view to reducing the effects of erosion. Many cases of saturator corrosion have been investigated, and in one or two instances it has been found that the presence of cresols in the acid-sulphate magma has been at least partially responsible for the attack.

It is one thing to attempt to standardize chemical sheet lead; it is another and a different thing to ensure that standardized chemical sheet lead is always supplied. With the best intentions in the world, it is conceivable that chemical sheet lead may be dispatched which fails to conform to the specification. What is certainly difficult is the ability to apply the various tests which one intends to impose on every sheet of lead, when one is receiving within a short period three to four hundred sheets, for the construction of sulphuric acid or other such chemical plant.

The writer is convinced that purity is of vital importance in the selection of chemical sheet lead, but he would not altogether disregard the results of subsidiary tests, made under conditions which are comparable with those which are likely to obtain in practice.

The addition of predetermined small quantities of copper may have a corrective effect when antimony is present in chemical sheet lead. It may aid the sale of chemical sheet lead by improving the results of the flash test; but to decide upon a certain quality of chemical sheet lead (say) for sulphuric acid chambers, or for ammonium sulphate saturators, merely on the basis of the flash test, would, in the writer's view, be unsound. A copper-free chemical sheet lead is preferable for many purposes to one containing a small quantity of added copper.

RESISTANT STEELS FOR CHEMICAL ENGINEERING.

Results of tests were detailed by Dr. W. H. HATFIELD, on chromium-nickel acid-resisting steel and 12 to 14 p.ct. chromium steel. He stated that an extensive investigation has been carried out to determine the resistance of the chromium-nickel steel to ammonium sulphate solutions, under numerous conditions of concentration and temperature. De-scaled sheet, in sections 6 in. by 1 in. by 18 gauge, was used as the material of test, and the steel was tested in three conditions—viz., (1) higher tensile; (2) air cooled from 1200° C.; (3) water quenched from 1200° C. For tests at 100° C., which was constantly maintained, a system of reflux condensation was employed, so as to maintain the solutions at constant concentration. In 15° C. tests, the specimens were totally immersed; similarly in 50° C. tests, the specimens were totally immersed; while, in boiling tests, the specimens were immersed to half their height in the solutions.

The figures showed that the steel is completely resistant in the "air cooled" and "water quenched" conditions to attack by pure solutions of ammonium sulphate at all temperatures. The higher tensile material is only very slightly less resistant, being faintly attacked at boiling-point by all strengths of solution. There was, however, no loss of weight in any of the experiments.

The following are extracts from the paper.

A heat-resisting steel known as Era/H.R., in addition to marked non-scaling qualities, offers great resistance to corrosive gases and fumes, and possesses extraordinary strength at high temperatures. It is well known that at about 800° to

900° C. ordinary steels lose practically all their strength, becoming incapable of supporting continuously the slightest load, and, in fact, sag under their own weight. Obviously a steel possessing desirable non-scaling qualities will be of little use if if does not also possess rigidity at these temperatures. The value of the special steel at once becomes evident. It possesses, when tested in the ordinary way, a tenacity of 19 tons per sq. in. at a temperature of 900° C., while at 700° C. its tensile strength is 31 tons per sq. in., equal to that of good mild steel in the cold and with similar ductility. Such tests, however, do not display to the full the qualities of the material.

The strength of materials at high temperatures is best shown by the load which they can sustain continuously; and results obtained in this way provide the engineer with a practical basis for design. With the steel described, at temperatures up to 800° C., for example, it is found that beyond a slight initial creep, characteristic of heat-resisting materials generally, a specimen may be loaded to a stress of 6·5 tons per sq. in. without suffering deformation, however long the load is maintained. Such a result is evidence of the valuable quality of the new material; and it may be added that in recent competitive trials, by an important authority, where a major consideration was the avoidance of sagging of metallic furnace parts, this particular steel proved the best, and has been adopted on a large scale.

Resistance to Action of Gases.

In the chemical industry, there are doubtless many conditions which require a metal showing marked resistance to the action of gases at high temperatures. As regards the resistance to direct oxidation by a gaseous atmosphere, the special steel scales hardly at all at temperatures up to 1000° C. and over; such slight scale as is formed being firmly adherent, and therefore to a certain extent protective. Even at temperatures approaching 1300° C., it still offers considerable resistance to wastage by oxidation.

Under the action of air at a temperature of 900° to 950° C., this alloy appears likely to last indefinitely. For example, a tray made of it has for over two years been used in the chemical laboratory of the Hecla Works. It is employed as a container to hold powdered refractory brick in order to burn-off any carbonaceous matter the brick may contain. To do this, the tray is heated in a muffle furnace with free access of air and at the temperature mentioned. It is frequently put into and taken out of the hot muffle; and notwithstanding the sudden alterations of temperature and the long exposure at well above a red heat, no distortion or appreciable alteration in weight has occurred.

The behaviour of this material when exposed to the more searching effects of the products of combustion in an oil-fired furnace may next be quoted. As is well known, the amount of sulphur present in fuel oils is of the order of 0·5 to 1 p.ct., and in consequence the atmosphere in this case is highly sulphurous. Nevertheless, in a spring-hardening furnace, oil-fired and working at about 900° C., cast racks of the alloy steel mentioned have been in use for over twelve months and are scarcely affected, whereas a rack made of ordinary steel was so much oxidized as to be of no further use at the end of twelve weeks. At that time the pegs of the carbon steel rack had become so thickened with scale that it was impossible to put anything between them. The furnace is only operated during the day, and cools down to about 450° C. during the night. This resistance to such severe conditions is truly remarkable, and is finding interesting application in many directions, such as furnace fittings.

The type of alloy which consists essentially of nickel and chromium, with iron as but a minor constituent, is familiar chiefly owing to its use as a heating element on account of its high electrical resistance and non-scaling properties. This material, however, does not possess the rigidity or resistance to the action of sulphurous gases which are such valuable features of the newer class of alloy, and has the further disadvantage—owing to its containing about 60 p.ct. of nickel—of being more expensive.

Pyrometer protection sheaths in the spring-hardening furnace to which reference has been made, have behaved excellently, while similar sheaths of an alloy containing a high percentage of nickel recommended for heat-resisting qualities lasted at the best for only five months.

It is a logical consequence of high tenacity at high temperatures that there should be also a high resistance to abrasion under these conditions. Slicing links made of this alloy have been in use for some time in the mechanical stokers of the boiler plant of a large electrical generating station in the North of England. It is noteworthy that these links work in a bed of molten clinker, and that the temperatures, due to the use of pre-heated air, are probably the highest carried in the combustion chamber of any mechanically stoked boilers in this country. Further, the demands on the brickwork are so severe as to call for a refractory superior to the best-quality firebrick usually available. The links have an average life of over 1000 hours actual steaming time.

There are many cases where materials of a non-metallic nature might be replaced by metallic materials, with advantage from the point of view of engineering design as well as that of heat conductivity. As an example, recuperator tubes are being made of this special heat-resisting material, whereas fireclay had previously been used for the purpose, with its attendant disadvantages of fragility and low heat conductivity. Since the essential function of recuperator tubes is to transfer heat by conduction, the employment of metal tubes, resulting in a great improvement in efficiency, is now rendered possible by the use of material with such high rigidity and chemical resistance to the furnace gases at high temperatures.

As regards the purely furnace side, the practical applications also include agitators and pokers for gas producers. Further examples of a miscellaneous character are case-hardening boxes, annealing trays, nozzles for gas burners, grids and other fittings for gas cookers.

Mention may be made of another product possessing striking heat-resisting qualities, and known as Era/A.T.V. steel.

The following gives a vivid example of the performance of this material. The rotor of a turbine driven by the exhaust gases of an internal combustion engine, has worked continuously at a temperature of from 800° to 900° C. when running at a speed of 30,000 r.p.m. It has, in fact, been run up to a speed of 53,000 r.p.m. for testing purposes, and the peripheral speed was then some 2200 ft. per sec. In these circumstances the metal is well above a red heat; and that it is able to withstand the centrifugal force produced at the speed mentioned seems worthy of attention by those interested in the construction of internal combustion turbines.

To meet the urgent demand for materials primarily to withstand chemical attack, where very high temperatures are not necessarily in question, a highly resistant alloy, Era/C.R., has been developed by Hadfields, Ltd. Experiments have shown, however, that this alloy also possesses considerable high-temperature resistance.

The steel is completely resistant to atmospheric corrosion, even in an industrial neighbourhood, and in tropical regions. It withstands the action of water, whether fresh or saline. For example, it is quite unattacked by sea water under alternately wet and dry conditions. Ammonium chloride or sulphate in solutions of various concentrations, cold or boiling, also the moist salts, are without action upon the alloy.

This alloy also offers a high resistance to attack by mine water containing ferrous and ferric salts in solution, and having an acid reaction; liquors of this character have been found to be very destructive of other corrosion-resisting alloys.

There is complete resistance to nitric acid of all concentrations and temperatures, to acetic acid B.P., cold or boiling, citric, formic, oleic, oxalic, and tartaric acids. Mixtures of nitric and sulphuric acid solutions used in various industrial processes are without action upon the alloy. Sulphuric acid solutions alone, in concentrations up to at least 25 p.ct. by volume, have but slight effect. Sulphurous acid solutions, even boiling, do not affect it.

A material which possesses chemical inactivity over so wide a range should prove of value in the chemical industry and other technical processes where corrosive liquids are being handled.

Chemically Resistant Steels.

In a paper dealing with chemically resistant steels, with special reference to very high and very low temperatures, Messrs. T. G. Elliot, F.I.C., and G. B. Willey, A.R.S.M., F.I.C., express the view that the newer types of nickel-chromium and other steel alloys mentioned by them offer great promise to the chemical engineer on the one hand and the mechanical engineer on the other. Such alloys are necessarily expensive, and not so easy to work as ordinary steels. Moreover, many difficulties have to be overcome in applying the material on a large scale for various special purposes. The authors have no doubt, however, that these will be overcome—in fact, this is being already accomplished.

Discussion on the Papers.

Dr. G. Bengough said that, thanks to the work of Mr. Evans, they now had a thoroughly good working theory which could be used in solving the problems of corrosion which arose in practice. In a great many cases the study of the problem of corrosion was reduced to the study of the chemical and physical characteristics of thin films. Dr. Walter Rosenhain (National Physical Laboratory) commented on a statement in Mr. Evans' paper that sometimes burnishing or polishing a metal made it more resistant to corrosion, and said that might be of greater importance than appeared at first sight. If the surface of a metal was made resistant in that way, it was due to two causes—the removal of porosity by mechanical means of flowing the metal in such a way as to fill-in all the interstices, and an actual change in the constitution of the metal itself. Mr. J. Rhodin, remarking on the statement by Mr. Evans as to the effect of the formation of films, and also the statement regarding polishing of the surface, said he had come across cases in which the very opposite was the case. Mr. Sidney J. Tungay, commenting on Mr. Parrish's paper on chemical lead, said that Mr. Parrish seemed to have cracked a very small nutshell and found inside a very large nut. As a member of the B.E.S.A. Committee for the standardization of chemical lead, he would say that 99·99 p.ct. purity was what the Committee had endeavoured to maintain. When the Committee came to investigate the samples of lead which

had been used industrially for a number of years, however, they found these samples in many cases to be coppery lead, which withstood the action of sulphuric acid and hot sulphuric acid extremely well. Moreover, these copper-rich leads showed less tendency to creeping when used for the construction of sulphuric acid chambers, and for the concentration of sulphuric acid, than the purest chemical lead; and therefore the Committee had to vary their opinions. It appeared that the presence of some copper in the lead was not necessarily deleterious. There was another factor which had arisen from the work of the Committee. These leads had been investigated by the Committee for two years, and it had been found that in order to give a 99·99 p.ct. metallic lead it was necessary to determine very closely what the remaining 0·01 p.ct. of impurities should consist of. Sometimes a very slight inclusion of an impurity would result in rapid breakdown when the material was used for the sulphuric acid chamber process. Mr. S. I. CROOKES (New Zealand) said that a case of difficulty with lead had come under his notice during the past two months. The lead came from the Broken Hill mines, and it was guaranteed as pure. It was very carefully treated under his supervision, and he recently erected some Glover towers of the material. To his astonishment, in a month holes appeared from half-an-inch to two inches long in two of the sheets. It seemed to be due to the crystalline structure which had taken place during the process of rolling from the pig.

THE "SULPHUR RECOVERY" PROCESS.

By F. W. SPERR, Jun., Director of Research, the Koppers Company, Pittsburgh.

[From a paper presented to the Canadian Gas Association.]

It appears entirely feasible, states the author, to accomplish the removal of all objectionable impurities from gas at a cost only slightly higher than the present cost of removing hydrogen sulphide alone. The total apparatus required, he goes on to say, should occupy much less ground space than what is needed for hydrogen sulphide removal. The slightly higher cost of producing a pure gas would certainly be far more than compensated by saving in distribution costs and by improved service. Dry purification involves the problem of disposal of the spent oxide, for which there is no market in Canada. The emptying and refilling of boxes, and the revivification and final disposal of the spent oxide, involve a large and irregular labour requirement. Also dry boxes are not feasible for gas under any considerable pressure. These and other considerations led to the development of the "Seaboard" liquid purification process. [The process has been described fully in the "JOURNAL"—Nov. 29, 1922, p. 566; Aug. 1, 1923, p. 419—so that only a brief résumé need be given here.]

The apparatus consists of a tower having two main sections, designated as the absorber and the actifier. These sections are filled with suitable packing—*e.g.*, coke, spiral tile, or wooden hurdles. The absorbing medium consists of a dilute solution of sodium carbonate (commercial soda ash, the ordinary strength of which is equivalent to from 1 to 3 p.ct. Na_2CO_3). This solution is pumped from a sump over the absorber, from which it flows by gravity into the actifier and thence back to the sump. The gas passes through the absorber in intimate contact with the solution, which removes from 85 to 95 p.ct. of the hydrogen sulphide and hydrocyanic acid, together with a smaller percentage of the carbon dioxide.

OPERATION OF "SEABOARD" PROCESS.

The solution containing the absorbed impurities flows down through the actifier, through which air is blown by a fan. The volume of air required is from two to three times the volume of gas purified. The air removes the hydrogen sulphide and regenerates the solution, so that it can be used over and over again. Some soda is used up in the formation of sodium thiosulphate and sodium thiocyanate and in mechanical losses, but the amount so consumed is very small. The usual consumption of sodium carbonate in the purification of coal gas is about 1 lb. for every 8 lbs. of hydrogen sulphide removed; some plants, however, showing much lower soda consumption figures than this.

The "Seaboard" process has one disadvantage, and this disadvantage is such as to limit or prevent its application in many cases. Where a large amount of hydrogen sulphide is being handled in the vicinity of residential districts, the odour of the actifier air may be sufficient to be objectionable. The obvious remedy is to burn the actifier air; and this is done in several plants, in some cases under boilers, and in others by consuming the air in water gas generators. Such means of disposal, however, are not available in many cases. The problem of modifying the process so that there would be no possible atmospheric contamination has had to be faced. In addition, it has been deemed desirable to recover the sulphur, if possible, in a saleable form, and to accomplish complete instead of partial liquid purification. The result has been the development of what may be designated the "sulphur recovery" process, which is now in operation in several American plants, and is being installed in several others, both here and in Europe.

SULPHUR RECOVERY PROCESS.

There are now two forms of the sulphur recovery process. The basic principles of the first, which we use in coal gas purification, were developed by M. D. Mann, Jun., and R. B. Lebo, of the Standard Development Company. The second, which we employ in the purification of water gas and other gases containing substantially no hydrocyanic acid, was developed by the Pacific Gas and Electric Company under the direction of W. S. Yard, the Vice-President. The patent rights of both of these developments are owned by the Koppers Company, which is responsible for a number of inventions covering the apparatus, operating methods, and various modifications.

The apparatus includes an absorber, in which the gas is brought into contact with the circulating liquid, and a so-called "thionizer," in which the solution coming from the absorber is subjected to the action of finely atomized air which revivifies the purifying medium, liberates free sulphur, and separates this free sulphur from the bulk of any other solid material suspended in the solution. Air is supplied to the thionizer by means of blowers, usually of the Roots or Connersville type. Air filters are provided to prevent dust from clogging the aeration apparatus. Other auxiliary equipment comprises circulating pumps for the purifying liquid, storage tanks, slurry pumps, sulphur filter, and apparatus for adding the necessary chemicals to the system.

In coal gas purification, the circulating liquid consists of a dilute solution of sodium carbonate, ordinarily containing from 0·5 to 2 p.ct. Na_2CO_3 and having an iron compound in solution or suspension. The amount of iron in the system is usually equivalent to about 0·5 p.ct. of F_2O_3, although in treating low sulphur gases smaller amounts may be used. A deficiency of iron is always attended by an increase of soda consumption. The process developed by the Pacific Gas and Electric Company employs a catalyst with the solution of sodium carbonate; but no iron is added. The catalyst is rendered inactive by hydrocyanic acid, so that it cannot be applied, without substantial modification of the process, to gases containing more than a small amount of this substance.

Returning to the employment of iron with a solution of sodium carbonate, it has been stated that the iron compounds may be in either solution or suspension. In certain stages of development of the process, alkaline iron solutions stabilized by various materials, usually of an organic nature, have been employed. Some of these solutions are very effective and are particularly useful in the starting-up periods of new plants. On the other hand, they have proved rather expensive, and in the long run more economical results have been obtained with iron suspensions. In the employment of such suspensions there are two essential requirements:

First, substantially all the iron must be in the ferric state. Any ferrous iron reacts to form ferrous sulphide, which is not only practically inert so far as the oxidation phase is concerned, but actually interferes with the satisfactory operation of the process.

Second, the iron compound must be in a very finely divided state. This state may be produced by mechanical pulverization or by precipitating the iron from a ferric solution and introducing the freshly-formed precipitate into the system. A few natural oxides do not require pulverization, and may be used directly.

There is also a third requirement analogous to the activity requirement in the case of oxides used for dry purification, and which may depend not only on the physical condition of the oxide, but on its molecular structure. For example, pulverized hematite ore is practically inactive, while a well-hydrated bog ore is very active. It is hoped that we shall be able to express this requirement by means of an activity test which is now being developed. The activity of a given oxide in dry purification is not necessarily a criterion of its effectiveness in the new process. For example, one of the commercial oxides which is generally recognized as among the best for catch box purposes has given inferior results in the sulphur recovery liquid purification system.

REACTIONS IN THE "SULPHUR RECOVERY" PROCESS.

For the purpose of exemplifying the chemical reactions that are believed to occur in the sulphur recovery process, it will be assumed that the reacting ferric compound is ferric hydroxide, $Fe(OH)_3$. In the absorber, the primary reaction is between the hydrogen sulphide and sodium carbonate, just as in the

"Seaboard" process—viz., $H_2S+Na_2CO_3=NaHS+NaHCO_3$. The sodium hydrosulphide reacts with ferric hydroxide in presence of sodium bicarbonate as follows:

$$3NaHS + 3NaHCO_3 + 2Fe(OH)_3 = Fe_2S_3 + 3Na_2CO_3 + 6H_2O.$$

There may also be some direct action between the hydrogen sulphide and the iron compound in suspension—viz.,

$$3H_2S + 2Fe(OH)_3 = Fe_2S_3 + 6H_2O.$$

All of the hydrocyanic acid in the gas is converted into sodium thiocyanate (NaCNS). The primary reaction is—

$$Na_2CO_3 + 2HCN = NaCN + NaHCO_3$$

NaCN reacts immediately with sulphur as follows:

$$NaCN + S = NaCNS.$$

Whether this reaction occurs with the small amount of sulphur carried into the absorber from the thionizer, or whether it occurs as an immediate consequence of the liberation of sulphur in the presence of NaCN in the oxidation phase of the process, has not been investigated. It is known, however, that no hydrocyanic acid exists in the air over the thionizer.

The liquid flowing into the thionizer contains sodium carbonate, bicarbonate, and thiocyanate, with possibly some unchanged sodium hydrosulphide in solution, and ferric sulphide with any excess of non-reacting ferric hydroxide in suspension. It also contains in solution sodium thiosulphate formed in consequence of secondary reactions which will be discussed later. The sodium thiocyanate and thiosulphate are inert so far as subsequent reactions are concerned.

In the thionizer, oxidation of the ferric sulphide with regeneration of the ferric hydroxide and liberation of free sulphur occurs as follows:

$$2Fe_2S_3 + 3O_2 + 6H_2O = 4Fe(OH)_3 + 6S.$$

This reaction forms two solid products, elemental sulphur and ferric hydroxide; and the natural question is, How is it possible to separate the sulphur from the iron compound which is to be returned to the absorber to play its part in the removal of additional quantities of hydrogen sulphide? The separation is accomplished by virtue of the beautiful discovery that the air which oxidizes the ferric sulphide can also perform what is technically known as flotation. The minute bubbles of air in the thionizer have a preferential attachment for the particles of sulphur, and not for the particles of iron compound. The sulphur liberated in the reaction is immediately lifted to the top of the liquid in the form of a foam or froth. It is the flotation principle which has within the past twenty years revolutionized the treatment of metallic ores, making possible the concentration of mineral values in a froth above the liquid carrying the valueless gangue. In metallurgical practice, flotation oils or reagents are necessary, while in this new gas purification process these are unnecessary except possibly in special circumstances. Credit for priority in this discovery is due to M. D. Mann, Jun., and R. B. Lebo, of the Standard Development Company.

The Sulphur Froth.

In normal operation, the liquid in the thionizer is covered with a blanket of sulphur froth from 6 in. to possibly 18 in. deep. It is possible to produce a thick foam carrying over 20 p.ct. of sulphur; but as this is difficult to handle, operation is usually conducted so that the froth contains 5 to 10 p.ct. of sulphur.

In metallurgical flotation, certain conditions are known to be unfavourable to the production of a good froth. For example, the addition of any considerable quantity of lubricating oil will "kill" the froth. We have an analogous condition in the sulphur recovery process in any circumstances when a considerable amount of tar may be carried with the gas into the absorber, and thus find its way into the circulating liquid. Considerable amounts of tar or oil condensates will cause the froth to disappear completely. In such cases, when froth is absent and when the amount of hydrogen sulphide in the gas is sufficiently high so that sodium hydrosulphide is introduced into the thionizer, the odour of hydrogen sulphide will be noticed near the solution inlet.

The sulphur froth ordinarily contains from 5 to 10 p.ct. of elemental sulphur. In some plants, the air pressure in the thionizer is maintained just sufficient to cause the froth to flow continuously into the sulphur trough, while in others the preference is for intermittent operation; the froth being allowed to accumulate until fairly thick, at which point the air pressure is raised so as to spill a quantity into the trough. Here the froth quickly subsides, through release of the larger air bubbles, into the form of a creamy slurry which flows into the slurry pits or tanks.

The absorber used in most of the sulphur recovery plants differs from that employed in the "Seaboard" process in that it is a combination of the hurdle type of gas washer with the saturator type familiar in ammonium sulphate manufacture. The saturator section constitutes the lower part of the tower. Here the gas enters and is distributed by a manifold into "cracker" pipes immersed in the liquid. The depth of the liquid through which the gas must pass is controlled by an adjustable seal in the outlet pipe, which is ordinarily about 6 in. A considerable reservoir is maintained in the saturator section to allow the reaction between the ferric compound and the sodium hydrosulphide to progress sufficiently before the liquid enters the thionizer. At some distance above the cracker pipe there is a conical steel shield constituting a division between the saturator section and the hurdle section. The latter contains several banks of wooden hurdles, the design of which has been improved over the usual construction, so as to ensure more effective and uniform distribution of the liquid. The general design of the upper part of the tower, comprising sprays, distributing hurdles, and spray separators, is the same as in the improved type of apparatus for the "Seaboard" process. The total height of the tower is usually about 60 ft.

Regeneration of Purifying Liquid.

The efficient regeneration of the purifying liquid and flotation of the sulphur require treatment with air, finely atomized by some means, so as to produce minute bubbles. The term "thionizer" has, for convenience, been invented to designate the apparatus in which such aeration is performed. The first means employed consisted of filtros or alundum plates or tubes through which compressed air was forced into the liquid. These gave trouble with clogging on account of the deposition of solid matter and possibly the crystallization of salts within the pores of the material; and to overcome this difficulty, an ingenious device consisting of a cloth aerator tube was developed. The standard cloth tubes are 5 in. in diameter by 9 ft. 6 in. long. Each tube is mounted on a steel pipe perforated at intervals for distribution of the air; and this pipe, submerged in the liquid, is connected to an air manifold above the thionizer tank. This arrangement makes it possible to withdraw any one of the tubes for inspection without disturbing the operation of the tank. In most of the plants now operating there is a rigid connection between the aeration tube and the air manifold, but in new installations an arrangement with a flexible connection is being substituted.

Each thionizer tank has several compartments arranged so that the solution may be transferred from any one compartment to another, and so that if the plant is running at less than capacity one or more compartments may be taken out of service. The depth of the liquid is about 42 in. Each compartment has baffles directing the flow of solution. The space between each pair of baffles generally contains four aerating tubes parallel to the baffles. The arrangement is such that the solution flows longitudinally over the entire lot of tubes in series. The parallel flow arrangement has been tried, but has been found to give less satisfactory results. The thionizer compartments are also usually operated in series.

The volume of air used in the sulphur recovery process is much less than in the "Seaboard" process; generally averaging about 300 c.ft. of air per 1000 c.ft. of gas. On the other hand, this air has to be delivered at a much higher pressure than in the old process; the pressure being determined by the depth and specific gravity of the solution and the resistance of the tubes. Ordinary pressures are from 3 to 5 lbs. per sq. in. Air entering the blowers is passed through air filters with replaceable filtering media which last for a long time without renewal.

Efficiency of the Process.

The efficiency obtained with the sulphur recovery process in the removal of hydrogen sulphide and hydrocyanic acid is very high. In normal operation the gas leaving the absorber contains no hydrocyanic acid, and the efficiency of hydrogen sulphide removal is usually higher than 95 p.ct. In fact, it has proved possible to operate at good capacity producing gas free from H_2S by the United States Bureau of Standards test. Such results have been obtained in continuous operation over considerable periods with apparatus comprising only one absorber; the inlet gas at one plant containing 100 grains of H_2S, at another plant 125 grains of H_2S, and at other plants 200 to 300 grains of H_2S per 100 c.ft. Continuous operation in this way with only one absorber cannot be recommended without the safeguard of a catch box. It would appear, however, that a plant having two absorbers could operate practically indefinitely for complete removal of hydrogen sulphide and hydrocyanic acid without the necessity of any auxiliary dry purification.

The installation cost of equipment for the sulphur recovery process, including catch boxes, is usually less than that of dry purification apparatus; the difference increasing with the size of the plant. The saving in ground area is remarkable. One large sulphur recovery plant now under construction occupies 25,000 sq. ft., two-thirds of which are required for catch boxes and oxide, while the same capacity in the form of dry purification equipment would require 100,000 sq. ft.

Estimates of operating costs for the treatment of 10,000,000 c.ft. of coal gas per 24 hours with a removal of 400 grains of H_2S and 40 grains of HCN per 100 c.ft. are shown in Table 1. The figures show that the cost of eliminating both hydrogen sulphide and hydrocyanic acid is about 1 cent per 1000 c.ft. It will be noted that the principal items for the operating cost are power, labour, and soda, and the possible credit for sulphur. The cost of iron and incidental supplies (tubes, &c.) is insignificant.

Table I.—*Cost of Gas Purification by Sulphur Recovery Process*

10,000,000 c.ft. coal gas per 24 hours.
H_2S removed, 400 grains per 100 c.ft.
HCN removed, 40 grains per 100 c.ft.

	Per Day.
Power for pumps, blowers, lighting, filtration, &c., 2550 H.P.-hr at 1 c.	$25·50
Soda, 0·35 lb. per M. c.ft., at 1·5 c.	52·50
Iron compound, 0·28 lb. per M. c.ft., at $7·50 per ton	10·50
Labour, 4 men at $5	20·00
Miscellaneous	6·00
Total	$114·50
Credit for recovered sulphur, 3000 lbs. at ½ c.	15·00
Net cost per day	$99·50
Net cost per 1000 c.ft. of gas	1·0 cent.

Possible Savings in Power Cost.

Some saving in the power cost may be anticipated through improvement of the aerating equipment. No definite prediction can now be made as to what may be accomplished in this respect with mechanical aerators, but an appreciable reduction of power requirements is anticipated.

The labour cost is especially important to the smaller plants. The same force of four men required for a plant of 8 to 10 million c.ft. daily capacity can operate a plant of 20 million c.ft. capacity. The labour cost in the smaller plants will depend upon the location of the apparatus. This should, if possible, be placed so that men from other departments can look after the apparatus in the afternoon and night shifts. In this way a small plant can operate with only one or two men in addition to the regular plant force. At the Madison plant, the operation is arranged so conveniently that no extra men are employed; the water gas machine helpers being able to give the purification apparatus all the necessary attention.

Soda Consumption.

The soda consumption in the sulphur recovery process is much higher than in the "Seaboard" process, due to the fact that the conditions of the new process are more favourable to the formation of sodium thiosulphate and sodium thiocyanate. The chemistry of the thiosulphate and thiocyanate formation is very interesting; but a full discussion of it would be beyond the scope of this paper. All the hydrocyanic acid in the gas is combined in the process to form sodium thiocyanate, and the equivalent soda required for this reaction may be considered indispensable. This amounts to 2 grains of soda for every grain of hydrocyanic acid, so that gas containing 35 grains HCN per 100 c.ft. will require 0·10 lb. of soda per 1000 c.ft. for fixation of the hydrocyanic acid.

With respect to sodium thiosulphate formation, the chemical considerations may be briefly summed-up by stating that free sulphur is the principal agent responsible for the production of this substance. The aeration of a solution of pure sodium hydrosulphide in the presence of sodium carbonate and bicarbonate produces no thiosulphate; but if a little free sulphur be added, or if the aeration be conducted in iron apparatus so that small amounts of iron rust can go into the system, producing free sulphur, sodium thiosulphate is formed. Thiosulphate formation occurs most rapidly in a system containing sodium hydrosulphide and free sulphur. It occurs less rapidly in a system containing sodium carbonate and free sulphur with sodium hydrosulphide absent, and still less rapidly in a system containing sodium bicarbonate and free sulphur with sodium carbonate and hydrosulphide absent. The reactions producing thiosulphate are favoured by high temperatures and high alkalinities.

Under normal conditions, thiosulphate is not formed to any appreciable extent in the absorber. Tests made by passing coke oven gas through the purifying solution for several days with exclusion of air from the system showed no increase of thiosulphate. It is possible that some thiosulphate would be produced with gas containing more than the usual amount of oxygen. However, in the regular operation of the sulphur recovery process most of the thiosulphate is undoubtedly formed in the thionizer.

One grain of hydrogen sulphide reacting to form sodium thiosulphate requires the consumption of 1·56 grains of sodium carbonate, so that consumption of 0·10 lb. of soda per 1000 c.ft. of gas for thiosulphate formation is equivalent to the fixing of 45 grains of hydrogen sulphide per 100 c.ft. of gas. In plants producing gas with a low hydrogen sulphide content, the value of the sulphur recovered in elementary form may not be sufficient to warrant the labour and extra equipment involved for the handling of such sulphur. Such plants may operate to advantage so as to convert all the free sulphur into sodium thiosulphate; the expense for the soda being offset by the saving in labour and equipment. This is the type of operation carried out in the liquid purification plant of the Madison Gas and Electric Company at Madison (Wis.). Here water gas containing about 50 grains H_2S per 100 c.ft. is purified in apparatus installed by the Koppers Company, all the sulphur being converted into sodium thiosulphate. The operation is a very economical one; no extra labour being required.

The sulphur slurry produced by the breaking-down of the foam that overflows from the thionizer is collected in storage tanks and filtered; the filtrate being returned to the system. Most of the plants use filter presses of the Kelly type; but good results have been obtained on a small scale with continuous filters, and one or two large-scale installations for continuous filtration are being planned. The filtration of the sulphur offers no special difficulty—which is quite remarkable, considering the extraordinary fineness of the particles.

In present practice little (if any) washing of the sulphur cake is required. After the cake has accumulated, it is dried for a short time in the filter with air which is preferably heated for this purpose. The filter is then opened, and the contents discharged. It is not feasible to dry the cake in the press to less than 40 p.ct. moisture. In fact, the average material produced contains about 50 p.ct. moisture. In appearance and consistency, the material resembles a moderately moist clay. Besides the sulphur and moisture, it contains iron oxide, sodium thiosulphate, and sodium thiocyanate; the two latter substances being dissolved in the adherent moisture. According to conditions, the percentage of sulphur on a dry basis varies from as low as 50 p.ct. to as high as 90 p.ct.

From 30 to 40 p.ct. of the sulphur in the gas enters into the formation of sodium thiosulphate and thiocyanate. In the removal of 400 grains of hydrogen sulphide per 100 c.ft. of coal gas, the total elemental sulphur recovered is about 0·30 to 0·35 lb. per 1000 c.ft. of gas.

Disposal of Sulphur.

The disposal of this sulphur at a good valuation, so as to offset part of the operating costs of the new process, is now one of our principal problems. Practically all the sulphur used in America is marketed as brimstone, which comes from the great native sulphur deposits of Texas and Louisiana, and has a high degree of purity. The annual consumption in the United States amounts to more than 1,000,000 tons; while if all the sulphur contained in all the artificial gas distributed in the United States were recovered, it would amount to less than 10 p.ct of this. The present price of brimstone is $20 per ton. If this full price were obtainable for the recovered sulphur, the credit would average possibly 0·3 c. per 1000 c.ft. of coal gas. Under present conditions, such a credit cannot be expected; but there are certain special uses to which the properties of the recovered sulphur render it so well adapted that it may eventually command a price superior to that of brimstone.

Our organization is also doing a great deal of work in the direction of utilization of the sodium thiosulphate and sodium thiocyanate that constitute the other bye-products of the process.

Safety in Mines Research Board.—A description of work forming part of a comprehensive research on the ignition of gases which is being carried out by the Explosives in Mines Research Committee has just been published by the Safety in Mines Research Board (Paper No. 24, "The Ignition of Firedamp by Momentary Flames," Part 1 by N. S. Walls and R. V. Wheeler; Part 2 by W. Rintoul and A. G. White. H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 9d. net). The ignition of mixtures of methane and air does not occur instantaneously when they are exposed to a flame. There must be a definite duration of exposure, dependent on the character of the flame. While a small gas flame requires an exposure of about 7 milliseconds, a duration of 3½ milliseconds suffices with a larger flame. The mixture of methane and air most readily ignited by a fully aerated flame contains between 9·5 and 10 p.ct. of methane; but, if the flame is not fully aerated, but can abstract oxygen from the mixture to which it is exposed, the most readily ignited mixtures are those containing an excess of oxygen.

Natural Gas in Poland.—Dr. Stefan Bartoszewicz, writing in the "Petroleum Times," remarks that Poland undoubtedly possesses tremendous sources of natural gas, the production of which is increasing. The appearance of it in oil wells before attainment of crude oil is generally experienced on all the more important oilfields. Particularly abundant has been the gas on the fields of Boryslaw and Tustanowice, and also at Bitkow; but during the last few years wells have been drilled having only gas production, on territories situated in the Lower Carpathians, some 40 kilometres north of existing oilfields. To these territories belong Kalusz and Daszawa. The gas there consists almost all of methane; consequently no gasoline can be obtained from it. In accordance with the opinion expressed by geologists, the appearance of gas on plains about 50 kilometres from the foot of the Carpathians, where the main fields in Poland are situated, is evidence that crude oil should be looked for in the Lower Carpathians, and that the oil zone in Poland is wide.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coal Blending.

SIR,—Mr. Brownlie's interesting synopsis on the above, recently published in the "JOURNAL," is very welcome. Certainly in the proposed, and I should say very desirable, coal reconstruction measures, grading, sizing, and blending are essential aspects of the problem of better utilization and more economic development of our coal resources, and require immediate large-scale attention.

Taken on the whole, it seems clear we should realize that blending is no universal cure for all ills, as there are weighty and serious difficulties, and often disadvantages, involved. As Mr. Brownlie points out, blending *per se* is a costly, tedious, and inconvenient operation, when dependent upon coals of different character alone; but, nevertheless, many advantages accrue therefrom under present low rates of heating used in carbonization, which offset such costly and awkward operations when blending is essential. That is, so far the limits depend more upon necessity than upon expediency. The minima of coking coal required to effect the desired coking blend, or the maxima of coking coal permissible to give a smokeless fuel, are, of course, the guiding principles; and transport is regulated accordingly.

But it is just here that it is most necessary to realize the importance of having some scientific guiding principle for measuring the blend and its properties in anticipation, and with reliability, as one does not require to be always experimenting on a more or less large scale—the present position. Here, I think, the rate of rise of charge temperature, in determining the rate of heating and the plasticity developed, is paramount. Likewise, the rate of charge temperature penetration in determining the gradient and the fissuring is of no mean or secondary importance; and if a means for relating blending to these fundamental factors is instituted, it will be realized that an easy road to success is available.

Next, I think it should always be realized that the most useful non-caking ingredients are cheap non-caking but high-volatile slacks, next coke breeze, and lastly anthracite and low volatile non-caking fuels.

It is further worth remembering that blending is only one arm, and that sizing is another equally valuable weapon in the same direction, and by combination still further latitude and economy can be obtained.

It is desirable, in my opinion, that H.M. Fuel Research Board should recommend standards of sized and blended and mixed fuels for general and district usage, numbered in accordance with their known values of ash, volatile, and oxygen, &c., which should then form staple selling commodities alongside the pure brands, so that special needs therefor could be satisfied, and equality between them be established, where necessary.

It is further important to realize that blending as a necessity is largely a defect of the present disabilities inherent in the various carbonizing systems giving only a low heating rate. When this rate is vastly intensified, poor coking coals do not require to be admixed with coking varieties, and swelling coals can be increased as to size of particle with impunity—still yielding a good coke where a proper offtake is provided. Reconstruction on this point need not therefore be expensive.

WM. EVERARD DAVIES.

5, *Tynybedw Terrace,*
Treorchy, Glam.,
July 20, 1926.

British Legion Appeal Fund.

SIR,—On this, the anniversary of the day upon which, twelve years ago, the British Empire entered the war, it behoves each one of us to pause, and consider how far our obligations to the men who faced the fury of battle have been fulfilled.

In many ways efforts not unworthy of our national honour have been made to mitigate the privations of the thousands who returned—many of them maimed and shattered in health—to face another struggle hardly less severe. But it is to supplement governmental action, to fill up the many gaps that exist, and to give assistance in the many hard cases of unforeseen calamity, that I ask for support on a generous scale for the British Legion Appeal Fund. Quietly, but effectively, this fund is bringing renewed hope and comfort to the many thousands of ex-service men of all ranks who, through no fault of their own, are in distress, to their dependants, and to the widows and children of those who gave their lives. As recently as last Whit Sunday the Prince of Wales referred to the British Legion as "one of our greatest organizations for doing good."

I believe that the great majority of British men and women keep fresh in memory the debt due to those of my old comrades who today are in distress, and that they are sincere in their desire to prove their gratitude. In this belief I appeal most earnestly for generous support, so that the debt may be liquidated.

Cheques, made payable to "Earl Haig's British Legion Appeal Fund," and crossed Barclay & Co., should be sent to the Organizing Secretary (Captain W. G. Willcox, M.B.E.), Appeal Department, British Legion, 26, Eccleston Square, S.W. 1.

HAIG, F.-M.

26, *Eccleston Square,*
London, S.W. 1,
Aug. 4, 1926.

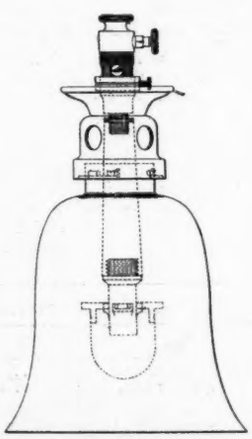
REGISTER OF PATENTS.

Incandescent Burners.—No. 254,445.

KEMPTON, C. H. & C. H. A., both of Westminster Bridge Road, S.E. 11.

No. 11,306; April 30, 1925.

By this invention the patentees seek to provide an incandescent gas fitting of small dimensions and neat appearance, without risk of fusing the upper portion of the globe, or causing back-firing.



Kempton's Burner Fitting.

As will be seen from the drawing which we reproduce, the upper portion of the burner carrying the nipple and the gallery is connected to the nozzle by means of a straight elongated central burner tube, preferably of refractory material. The globe and/or the gallery fitting is provided with a cylindrical extension or opening cooperating with the upper portion of the straight central burner tube so as to leave the latter projecting considerably below the former to carry the mantle and to provide an annular passageway through which the products of combustion pass. These escape to the atmosphere by way of lateral openings in the upper part of the cylindrical portion of the globe and/or the gallery fitting; the arrangement being such that the opening in the top of the globe and/or the cylindrical extension is of a diameter not appreciably greater, but preferably less, than the diameter of the magnesia supporting ring of the mantle.

The cylindrical gallery fitting is provided either as a separate member or as an integral part of the fitting with a curved deflecting member or cone adapted to direct the products of combustion outwardly and thereby prevent their mixing with the incoming air.

Washers.—No. 254,382.

KIRKHAM, HULETT, & CHANDLER, LTD., HERSEY, S., and STOKES, F. W., all of Norfolk Street, W.C. 2.

No. 8636; March 31, 1925.

The gas-washing apparatus referred to in this specification is of the well-known type described in patent No. 18,129 of 1908; but in order to increase the time of contact and reduce the back pressure, according to the present invention means are provided for deflecting the gas in its passage through the vessel so that it travels first against the spray and then with the spray.

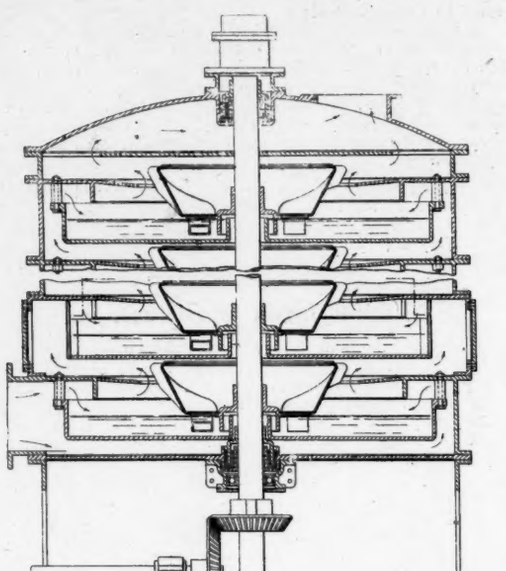
A sectional elevation of the washer is reproduced.

In each chamber is a dished plate of smaller diameter than the wall of the chamber; the space between the periphery of the plate and the wall of the chamber allowing the gas to pass from chamber to chamber, instead of through central openings. The shaft passes through an upstanding ring at the centre of each plate.

The chambers themselves consist of rings provided with one or more manholes, and bottom plates dished as above described, which may be cast integrally with the rings or supported therein. The dishes are cut away at those portions of the periphery opposite the manholes, and provided with removable covers.

Above each dish is a baffle, preferably formed integral with each

chamber ring. This baffle is designed to deflect the gas and cause it to flow first against the spray and then with the spray, which is attained by inclining the baffle downwards; the lower portion coming horizontally about the centre of the perforated rim of the sprayer.



Gas Washer.—Messrs. Kirkham, Hulett, & Chandler.

A suitable form of sprayer comprises a collar to which is attached a circular plate forming the bottom of the sprayer with openings in same over which, on the underside of the plate, are attached a number of curved spouts; and at the periphery of the plate is attached a perforated rim to which are fitted externally and internally a number of vanes, the former being designed to assist the gas in its passage through the vessel and the latter to assist in expelling the liquid lifted into the sprayer by the curved spouts.

The vertical shaft of the vessel is suspended by a ball thrust bearing; a journal ball bearing being fitted below same, and a similar bearing at the foot of the shaft. In order to obtain a gas-tight joint there are mercury seals at the top and bottom of the shaft in lieu of the stuffing boxes and glands hitherto fitted.

Coin-Freed Mechanism.—No. 254,525.

WORTLEY, R. S., of Claverdon, and SPRAGUE METER CO., LTD., of Leamington Spa.

No. 18,422; July 20, 1925.

In order to adapt coin-freed gas-meter mechanism for use with coins of different values, it is necessary to make two adjustments—one of which is called for owing to the difference in the diameter of the coins, while the other arises from the difference in value; and the present invention consists in the combination of an axially adjustable crown or coin wheel and an axially adjustable pinion, the former providing accommodation for coin diameter and the latter effecting the required alteration in gear ratio.

The patentees remark that neither of these features is in itself broadly new; but it is believed that their use in combination is a novel invention, and when carried out in the manner described offers many advantages by reason of its simplicity and accessibility.

The claims show that the axial position of the crown or coin wheel relatively to the price change plate is definitely determined by an axial adjustment of the crown wheel shaft relatively to a collar thereon which is free to rotate between a pair of fixed lugs; and the pinion [above-mentioned] is axially adjustable, into and out of mesh with suitable reduction gear, upon a tubular member which is free to rotate but not to move endwise on the crown wheel shaft, and is in operative connection with the mechanism controlling the opening and closing of the inlet valve.

When a coin of high value, such as a shilling, is used, the pinion is driven indirectly from the meter spindle by a reduction gear which is a self-contained unit and readily detachable.

Indicator and Lock for Coin-Freed Mechanism. No. 254,526.

WORTLEY, R. S., of Claverdon, and SPRAGUE METER CO., LTD., of Leamington Spa.

No. 18,423; July 20, 1925.

This invention has for its object to provide an improved and simple means whereby the amount of the commodity prepaid may be readily indicated, and to prevent the insertion of further coins after the mechanism has reached the end of its travel.

A sleeve having two flanges is arranged so as to be free to slide, but not to rotate, on the coin shaft, and has a screw connection with a member which is operated by the meter-recording mechanism. One of the flanges of the sleeve operates the gas inlet valve, while the other flange engages with the short arm of an indicating lever pivoted on the back plate. The long arm of this lever functions as an indicator; its end being provided with a pointer moving over a visible scale. The short arm of the indicating lever is inclined to the axis of the flanged sleeve to such a degree that the movement of the long arm consequent on the axial movement of the flanged sleeve is proportional to the amount of gas prepaid.

The extremity of the short arm is formed with an abrupt rise, so that when the sleeve approaches the extreme end of its travel in the opening movement of the inlet valve the long arm of the lever is caused to enter into engagement with the coin wheel, thus locking the same against rotation and preventing insertion of further coins and consequent straining of the mechanism.

When the prepaid quantity of gas is consumed, the flanged sleeve in its return movement, having moved away from the abrupt rise on the indicating lever, leaves the latter free to fall or to be moved out of engagement with the coin wheel, which can now be rotated and further coins inserted. The return or releasing movement of the lever may be effected automatically by a suitable weight or spring, or may be positively returned in any appropriate manner.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 28.]

Nos. 17,975-18,546.

CROSSLEY, H.—"Grids for gas purifiers." No. 18,542.
DENMANN, W.—"Neutralizing ammonia crystals." No. 18,247.
DURAND, E.—"Gas, &c., valves." No. 18,104.
PAPACKOVA, S. IMHOFF-.—"Gas compressors." No. 18,246.
SADLER, H. S.—See Crossley, H. No. 18,542.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of refractories." No. 18,448.

Co-Partnership at Aldershot.

The annual meeting of the Co-Partnership Scheme and the Hospital and Benevolent Fund in connection with the Aldershot Gas, Water, and District Lighting Company was held on Saturday, July 24. Mr. R. W. Edwards, Chairman and Managing Director of the Company, presided over the business meeting. The report of the Co-Partnership Committee stated that the savings account gave the figure of £875, and that no less than £11,120 had been passed through the account since 1913. The report of the Hospital and Benevolent Fund stated that the reserve fund stood at £218. The Chairman, in moving the adoption of the report, said that, in spite of the coal strike, there had been no necessity to restrict the use of gas, and he did not see any necessity to warn their consumers to curtail their requirements. Notwithstanding difficulties of manufacture, the average quality of their gas over the quarter ended June 30 was 526·4 B.Th.U., while their official standard was 525 B.Th.U. per c.ft. Unfortunately, continued Mr. Edwards, the co-partnership bonus was less for the year; being at the rate of 6⅛ p.ct. This was due to the operation of the sliding-scale. He was afraid that, owing to the recent revision of the Company's standard price to 14·4d. per therm, the co-partnership bonus would be further reduced in respect of the current year to £4 14s. p.ct.

The Vale of Leven Gas Company, Ltd., Alexandria, have decided to pay a dividend of 8 p.ct. The price of gas, which is the same as last year, is fixed at 3s. 4d. per 1000 c.ft. for ordinary consumers, and 3s. 9d. for prepayment consumers.

Barrow Gas and Water Departments.

In his annual report upon the finances of the Barrow Corporation, the Borough Treasurer states that during the three years ended March 31 last the income from the sale of gas, public lighting, residuals, and sundries has been: 1923-24, £97,207; 1924-25, £97,332; and 1925-26, £90,416. The sale of gas in 1925-26 produced £1399 less than the preceding year. Coke realized £4427 less, and tar and ammoniacal liquor £1177 less, while sulphate of ammonia showed an increase of £73. The expenditure in respect of coal, oil, manufacture and maintenance of works, and interest and sinking fund charges for the last three years has been: 1923-24, £92,921; 1924-25, £97,773; and 1925-26, £92,145. The results for the three years are:

—	Gross Profit.	Net Profit.	Net Loss.
	£	£	£
1923-24	19,283	4,286	..
1924-25	14,676	..	441
1925-26	13,314	..	1,729

During the past year the sum of £10,319 has been expended from the renewal fund; and at March 31 last the fund showed a deficiency of £3176.

The Kirkintilloch Town Council have decided to supply gas to Milton and Lennoxtown if the District Committee pay the cost of extending the main to these places from Kirkintilloch.

PARLIAMENTARY INTELLIGENCE.

GAS LIGHT AND COKE COMPANY'S BILL.

The Minimum Dividend.

The Committee of the House of Lords (presided over by Earl Beauchamp) who have been considering this Bill met on July 26 to approve a proviso to be inserted in the Bill to give effect to their decision (see "JOURNAL" for July 28, p. 212). The proviso is to be added to the clause giving the Company authority to apply a minimum dividend of 5 p.ct. to the Ordinary Stock; and, in the form in which it was put forward by the Company, it empowered the Board of Trade, on the application of a local authority or the Company, as the case might be, to annul, suspend, or reduce the minimum dividend, or to cancel such suspension, or increase the minimum dividend again up to 5 p.ct., at periods of five years, "if, having regard to any material change in the circumstances . . . they think fit." This last passage was the subject of discussion.

The Hon. EVAN CHARTERIS, K.C. (for the London County Council and the Middlesex County Council), said he could not find, in the Committee's decision, anything which constituted a justification of the words quoted. He understood the Committee's decision to be that, at the end of five years, the minimum dividend was to be the subject of investigation, if the local authorities chose to take action in the matter, by the Board of Trade, but the Company had inserted words which acted as a limitation of that decision, as he conceived it. As an example, he said that if, during the next five years, the Company paid the minimum dividend, but charged a price for gas which was higher, were the sliding-scale in operation, than would entitle them to pay a 5 p.ct. dividend, it would not be said that this was a material change in circumstances. If he had understood the Committee's decision rightly, it was that the local authorities should be entitled to ask the Board of Trade to investigate again the principle of the minimum dividend—not because there had been any material change of circumstances, but because there had been an opportunity of seeing it in full operation. In an Order of the South Suburban Gas Company there was a clause which made provision for reference to the Board of Trade after a period of five years; but in that clause there was no reference to any change of circumstances or any alteration of conditions. There was simply *carte blanche* liberty to apply to the Board of Trade, without any restriction at all.

Mr. ARTHUR MOON (for the West Ham Corporation) and Mr. EDGAR MACASSEY (for the East Ham Corporation) supported the contention that the words complained of should be omitted.

Mr. H. P. MACMILLAN, K.C. (for the Company), observed they attached great importance to the words in question. Surely, he said, the only relevant subject for consideration at the expiration of five years would be anything which had not been placed before the Committee—something which had transpired in the interval which was material to the issue, and which ought to call for a revision or an alteration of the régime which the Committee had handed to the Company. He made no secret of the fact that the Company were desirous of excluding a rehearsal of all the arguments which had now been presented twice to Committees of Parliament; they desired to have the matter tested fairly on the experience. Surely it was not suggested that the local authorities should be entitled to go to the Board of Trade if there had been no material change of circumstances since Parliament had pronounced upon it, or if the change were immaterial. The example which had been selected by Mr. Charteris was peculiarly unfortunate for the purpose. He (Mr. MacMillan) should think that there could be no more material change of circumstances than that during the five years' period the Company had raised the price of gas to the consumers materially, and at the same time were paying a 5 p.ct. dividend. The most material change which could happen with regard to a gas undertaking was the raising of the price to the consumer; and if there were a rise of any consequence it would be a material change of circumstances upon which the local authorities would be entitled to found an application. The Committee were not merely providing for one quinquennium, but for a series of quinquennia. Was it to be said that each compartment of five years was not to be self-contained, but that they were to be entitled to rehearse matters which were closed by a previous decision in order to get a reflected light upon the quinquennium actually under consideration? That would put the Board of Trade in the position of revising the policy of Parliament, which the Committee had declared, and, presumably, on the same materials. He pointed out also that if the Company applied to the Board of Trade to have a suspension annulled or the minimum dividend restored, they would have to assume exactly the same burden, and would have to show a material change of circumstances.

The CHAIRMAN, after further discussion, said that the Committee wished to follow the precedent set in the South Suburban Order, and the words complained of, therefore, should be omitted.

The proviso, as approved by the Committee, was as follows:

> Provided that (*a*) if at any time within one month after the expiration of a period of five years from the first day of March, 1927, or of any succeeding period of five years, any authority (being a local authority within the meaning and for the purposes of the Gas Regulation Act, 1920) having jurisdiction within any part of the limits of supply for the time being of the Company shall apply to the Board of Trade for an Order annulling or suspending the operation of the provisions of this section, or reducing the rate of 5 p.ct. per annum referred to therein, the Board of Trade may, if they think fit, make an Order annulling or suspending for such period as they may decide the operation of the said provisions, or reducing to such an extent as they may determine the said rate of 5 p.ct. per annum. (*b*) If and so long as the operation of the said provisions is suspended or the said rate is reduced below 5 p.ct. per annum by virtue of any Order made under the foregoing proviso (*a*), and for the time being in force, the Company may at any time within one month after the expiration of any such period of five years as aforesaid apply to the Board of Trade for an Order cancelling such suspension or increasing such reduced rate; and the Board of Trade may (if they think fit) make an Order cancelling such suspension or increasing such reduced rate to any rate not exceeding 5 p.ct. per annum. (*c*) Any Order of the Board of Trade under this proviso shall be made under and in accordance with the provisions of section 10 of the Gas Regulation Act, 1920, with respect to the making of Special Orders, and (i) for the purposes of this proviso the expression "the undertakers" in the Schedule to that Act shall mean the applicants for the Order; and (ii) any such Order shall for all purposes be deemed to be a Special Order within the meaning of the said Act. (*d*) Any Order made under the foregoing proviso (*a*) or (*b*) shall, during the continuance thereof, have the same effect as if enacted in this Act.

The date from which the proviso is to have effect—namely March 1, 1927—was agreed upon by all parties concerned, it being pointed out that by March 1 in any year the complete accounts of the previous year would be available, and by March 1, 1932, which was the first date on which an application for revision could be made, complete accounts for the whole five years would be available. Also, the Company would not be embarrassed in the matter of the declaration of a dividend.

HOUSE OF LORDS.

Progress of Bills.

Bolton Corporation Bill and Mynyddislwyn Urban District Council Bill: Returned from the Commons, with the amendments agreed to.

Gas Light and Coke Company's Bill: Reported from the Select Committee, with amendments. Read the third time, passed, and returned to the Commons.

London County Council (General Powers) Bill: Returned from the Commons, agreed to, with amendments.

Swindon Corporation Bill: Read the third time, with the amendments. Passed, and sent to the Commons. Returned from the Commons, with the amendments agreed to.

Special Orders.

Birkenhead Corporation Gas Order, Dunstable Gas Order, and Haslemere and District Gas Order: Approved.

Burgess Hill and St. John's Common Gas Order, and Grays and Tilbury Gas Order: Report from the Special Orders Committee that no petition had been presented praying to be heard against these Orders, and that there was nothing in them to which it was necessary to call the attention of the House.

Mossley Gas Order: Petition deposited on behalf of the Saddleworth Urban District Council.

HOUSE OF COMMONS.

Progress of Bills.

Bolton Corporation Bill: Lords amendments considered, and agreed to.

Newcastle-upon-Tyne Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Swindon Corporation Bill: Lords amendments considered, and agreed to.

Gas Regulation Act.

Gas (Amending Orders) Rules, 1926: Copy presented.

Special Orders.

Birkenhead Corporation Gas Order, Dunstable Gas Order; and Haslemere and District Gas Order: Approved.

Thornton-le-Fylde Gas-Works Results.—Speaking at a meeting of the Thornton-le-Fylde District Council, Mr. Bailey said they had reason for satisfaction with the results of the working of the gas undertaking. In spite of an increased cost of coal, a reduction in the price of residuals, and heavier charges for interest and sinking fund, there was a net profit of £1934, against £1430 for the previous year. This result was due to an increased consumption of gas, equal to 20 p.ct., and a diminution in unaccounted-for gas, which was under 3 p.ct., against 7 p.ct. average for the previous three years. The Department had also borne the cost of special renewals of plant amounting to £443. The price charged—4s. per 1000 c.ft.—was low; but the coal dispute and the introduction of electricity precluded any further reduction during the current year.

LEGAL INTELLIGENCE.

HELPS v. THE OLDHAM CORPORATION.

Judgment for the Corporation on the Claim and Counterclaim, with Costs.

Mr. George Helps, Engineer and Manager of the Nuneaton Gas Company, lost his action in the Chancery Division against the Oldham Corporation. Judgment was given on Wednesday, July 28, by Mr. Justice Lawrence, who had taken some time to consider the arguments and evidence, the hearing of which occupied over three weeks.

Mr. Helps asked for an account from the Oldham Corporation, the defendants in the dispute, of the royalties due to him for the use of his inventions for the maintenance of low-grade gas. In the alternative, he asked for damages for alleged breach of contract, and an injunction restraining the Corporation from using his ideas and inventions at any but their Higginshaw Works. In reply, the Oldham Corporation counterclaimed for damages for an alleged breach of an agreement under which Mr. Helps guaranteed, they said, that the plant at the Higginshaw Works would yield a minimum of 15 million B.Th.U. per ton of coal used.

In his judgment, Mr. Justice Lawrence remarked that the plaintiff in the action was an ardent advocate of the use of low-grade gas. He said it could be more cheaply manufactured than high-grade gas, just as easily distributed, and would give a better service to the consumer, because he could make more efficient use of it. Mr. Helps's slogan, said the Judge, was "one thermal unit is as good as another," meaning that a thermal unit of low-grade gas was equal to, or, indeed, of more use than, a thermal unit of high-grade gas. He claimed that, for town supply, low-grade gas was the best, and was the gas of the future. This allegation was challenged, it being said that there was little or nothing in the plaintiff's suggestions which was unknown to the gas industry in 1918, when the agreement in question was signed.

"It is clear," proceeded Mr. Justice Lawrence, "that the question of the manufacture of low-grade gas has been the subject of considerable research, and has given rise to much discussion in the gas industry. Mr. Helps has been a prolific inventor, and has obtained numerous patents. As a result of demonstration, Mr. Parry and Mr. Duxbury, of the Oldham Corporation gas undertaking, were convinced that it would be advantageous to the Corporation to set up a plant which would test Mr. Helps's propositions. Accordingly, on June 12, 1918, Mr. Helps proposed that a new plant should be erected at Oldham, according to his own specifications, for the production of auxiliary gas for mixture with the coal gas the Corporation were already manufacturing. And after discussion the Corporation decided to obtain a licence from Mr. Helps for the adoption of his ideas; to make a contract with Gas Distribution, Ltd., for the instalment of a 'Pleno' plant at Higginshaw, and to make a contract with the same firm for the supply of certain hotplates and burners.

"Under the agreement made in consequence of this decision, the Oldham Corporation secured the right to test Mr. Helps's ideas before adoption, and they agreed to pay him royalties in case of adoption; the plaintiff agreeing to make certain allowances or payments in case the plant at Higginshaw did not give the guaranteed results. The erection of that plant was duly completed, and it was not disputed that it was intended to be used with coal, and to act as a complete gasification plant. Mr. Helps had maintained that, when so used, destructive distillation would take place in the retort, and the resultant gas would be higher in calorific value than ordinary producer gas. Everybody concerned with the plant and its working did all that was humanly possible, in the hope of making it a success, but after three months' working it was so completely blocked-up that it had to be stopped for three weeks, in order that it could be cleaned. It is plain from the evidence that the Nuneaton plant differs essentially in design and construction from the Oldham plant, and the method of working the Nuneaton plant is not the same as that which obtained at Oldham. The results obtained at Nuneaton afforded no criterion of the results that had been, or could be, obtained at Higginshaw. No distinctive distillation of the coal had taken place in the Higginshaw plant; and I am not satisfied that the gas produced was of higher calorific value than gas made in an ordinary producer plant worked as that plant should be. Mr. Helps's plant, as constructed, could not be satisfactorily worked on coal."

Regarding the tests carried out at Oldham subsequent to the hearing of the case in December last, the plaintiff had requested the defendants to provide (1) a separate steam supply at the base of the four generators which were served by the two superheaters, (2) a liquor spray to operate on the generated gas just after it emerged from the generator and before it was introduced into the superheater, and (3) a steam supply at the bottom of the superheaters. The defendants complied with the third request, but objected to the first and second, on the ground that if complied with the design and method of operating the plant would be altered and the test would, therefore, not be a fair test of the plant as originally designed and constructed. On the other hand, the defendants requested the plaintiff to allow separate calorimeters to be placed on the retort and generator gas pipes and on the joint retort and generator main, and also to allow the defendants' expert to take the temperature of the coal in the retort during the tests. Both requests were refused by the plaintiff, who contended that he was not concerned with the question of the different calorific values of the retort and generator gases or with the question whether any distillation of the coal took place in the retort.

In his Lordship's opinion, it was a pity that the parties adopted this attitude toward one another, which seemed to have been brought about by a misunderstanding. The request by the plaintiff to have steam provided at the bottom of the two generators and in the superheaters, and a liquor spray in the generator gas pipe, seemed to him not only to confirm the conclusion at which he had arrived—that the plant as designed and constructed could not be satisfactorily worked on coal—but also that the plaintiff and his experts were aware of the fact. As the tests could not be worked with the plant in the condition in which it was originally designed and constructed, it could, in his Lordship's opinion, have done no harm to the defendants' case if they had acceded to the plaintiff's request, and allowed him to make a further alteration.

The plaintiff's refusal to allow calorimeters to be fixed to the retort and generator gas mains, or to allow temperatures to be taken in the retort, seemed to point to his being afraid that he might thereby be proved to have been wrong in his theory as to destructive distillation of coal taking place in the retorts at Oldham.

In a 96 hours' test, the eight generators, the two superheaters, and the two condenser-scrubbers were in operation. During this test the plaintiff and Dr. Davidson became dissatisfied with the results shown, and eventually, after the test had proceeded for about 48 hours, the plaintiff and Dr. Davidson formally withdrew from it. Notwithstanding the withdrawal of the plaintiff and his expert, the defendants continued the 96 hours' test and brought it to its conclusion. After such withdrawal, the defendants made tests of the temperature in two of the retorts, from which it appeared that the temperature did not go appreciably higher than 100° C. except on one occasion in one of the retorts, when it went up to about 260° C., at a depth of 8 ft. 6 in. down the retort, which at that time was nearly empty of coal. Having regard to the short time during which the coal remained in the retort, it was plain that the temperature in the retorts was wholly insufficient for any distillation of the coal in the retort.

His Lordship was not concerned to decide whether the Higginshaw plant was, or was not, a complete gasification plant. The licence which governed the rights of the parties was silent as to the manner in which the plant was to operate. All the plaintiff had guaranteed was that it would yield 20 million B.Th.U. per ton of coal, and if it did not yield 15 million B.Th.U. he would pay the Corporation one-quarter of the amount expended on the plant by way of liquidated damages. The "Pleno" plant at Higginshaw was, however, badly designed and, in his (the Judge's) opinion, industrially impracticable when coal was used as the producing fuel. In 1921 the calorific value of the gas supplied by the Oldham Corporation fell as low as 375 B.Th.U. per c.ft., but this afterwards rose until, last year, it was 411 B.Th.U. In those circumstances, the question arose whether Mr. Helps was entitled to any royalties. Treating the licence as confined to the use of the "Pleno" plant, and paying no attention to the fact that this plant was not the subject of letters patent, it had been clearly proved that the Corporation of Oldham had never installed or adopted the plant at any other of their gas-works within the meaning of clause 3 of the agreement. In addition, the Corporation had never decided to adopt the invention. In those circumstances, no royalties were, in his judgment, payable in respect of the use of the plant at Higginshaw.

With regard to the gas patent No. 111,495, his Lordship said he did not feel at liberty to hold that the licence did not apply to it, but the time for the payment of royalties had not yet commenced, because the test period for the "Pleno" plant had not terminated. As the plant could not be worked commercially with coal, he was of opinion that the Corporation did not, and could not, obtain the guaranteed minimum of 15 million B.Th.U. per ton of coal used. Consequently, the defendants were not liable for the payment of royalties, nor had there been any wrongful or illegal use by the Corporation of any information of a confidential nature such as entitled Mr. Helps to damages. As a matter of fact, he did not think Mr. Helps had disclosed to the Corporation anything which, in 1918, was a useful contribution to the knowledge of the gas industry. As he was of opinion that the Corporation had not obtained the guaranteed minimum of 15 million B.Th.U. per ton of coal used, it followed, as a matter of course, that the Corporation were entitled to succeed on their counterclaim for a quarter of the amount expended on the plant. The action would, therefore, be dismissed with costs against Mr. Helps, and judgment entered with costs for the Corporation for the sum of £4257 9s. 3d.

Embezzlement Charge.

Henry Francis Murphy, formerly collector of the Dundalk (Co. Louth) Gas Company, has been returned for trial to the next Circuit Court, charged with the embezzlement of £535, the property of the Company. Giving evidence at a Special Court, Mr. George Airth, the Manager, said the accused had been employed by the Company from Oct. 6, 1921, until June 1 last, when the discrepancies were discovered. At the end of the last March quarter, witness noticed that the outstanding accounts were increasing. After the current accounts for March had been made out, witness personally added all arrears on individual customers' accounts, and the collector remade out the accounts, substituting them for those that witness had already prepared. On June 1 witness again sent out copies of the accounts, and then found the defalcations. The following day the accused admitted he had done wrong, and that he owed the Company £489.

MISCELLANEOUS NEWS.

BROKEN SOCKET ON A LARGE GAS MAIN.

The newspapers nine or ten days ago had prominent accounts—some illustrated—of work which was proceeding in Commercial Road, E. (near Limehouse Church), in searching for an escape of gas. The notices were somewhat embellished by the reporters, certain of whom incidentally enlarged the number of men employed on the job from 30 to between 200 and 300. That little departure from truth is a fair exemplification of other statements which were published.

The plain facts are these: Several complaints were received by the Commercial Gas Company about noon last Friday week; the presence of gas being reported at premises along the Commercial Road between Lowell Street and Burdett Road. In addition to the mains of the Commercial Gas Company, the Gas Light and Coke Company have a 48-in. main there; and they were advised of the escape. A joint examination was made by representatives of both Companies. It was decided to open four holes covering a distance of some 400 yards. When the concrete had been broken up, gas was found in evidence in the hole nearest Salmons Lane. Excavation was continued at this point; and the other openings were left to ventilate the ground. The gas was being carried along the road by the ducts containing the tramway cables; and these ducts and the sewer were ventilated by raising the covers of several manholes. The 48-in. main is under the tramway tracks at this point; and as the tramway is constructed on the conduit system, it was necessary to open between the two sets of rails, and drive under them to the joint on the main.

After working day and night from the Friday to Monday with gangs of thirty men, and making several more openings, the escape was found to be due to a split socket—the fracture extending some 3 ft. 6 in. from the face. This was patched-up by a plate and bands; and when we were in communication with Mr. Stephen Lacey, the Distributing Engineer to the Gas Light and Coke Company, last week, preparations were being made to cut out the pipe, and repair with a pipe and collar. The escaping gas was fired several times; but the flames were quickly extinguished by partially filling-in the opening, and beating out with sacks.

FEDERATION SULPHATE PRICES.

September—May.

The British Sulphate of Ammonia Federation, Ltd., in the course of a circular letter say:

"Owing to the coal stoppage our production has been greatly reduced and is fully sold until the end of August. For this reason September is the earliest month for which we are quoting prices to farmers. Our new prices represent a reduction of about £1 per ton, or 7½ p.ct., as compared with last year's prices. The unit of nitrogen in sulphate of ammonia at the average of these prices costs about 11s., so that nitrate of soda containing 15 p.ct. of nitrogen would have to be sold at £8 10s. 6d. per ton delivered to your nearest station to be on the same level.

"Even if there is an early resumption of work in the coal mines, it will take many months for the coke-ovens to reach their normal output of sulphate of ammonia again; and for this reason we cannot guarantee that sufficient supplies will be available in any given month. It is, therefore, desirable that orders should be placed with us immediately for the whole of the season.

"We reserve the right to raise our prices at any time by sending out a printed notice to that effect. Any such increase in price will apply to all orders received after the date of issue of the notice.

"In response to the numerous requests from farmers and others that we should simplify our method of pricing sulphate of ammonia, we have decided in future to guarantee a minimum percentage of 20·60 nitrogen for neutral quality, instead of selling on the basis of 21·10 p.ct., with reductions in price for any deficiency. As the bulk of our deliveries will continue to contain from 20·90 to 21·10 p.ct. of nitrogen, the alteration in the guarantee will not involve any lowering of quality, but will serve to standardize the price.

"We have also decided to abolish the allowance for taking delivery *ex*-works, and instead to sell any quantity from 1 ton upwards *ex*-works at the same price as a 4-ton lot carriage-paid to buyer's station. Lots of less than 4 tons delivered by rail or water will be charged for at higher rates. . . .

"We offer to sell sulphate of ammonia for home agricultural use at the following prices for delivery in:

1926.	£ s. d.	1927.	£ s. d.
September . . .	11 7 0	January	11 15 0
October	11 9 0	February	11 18 0
November. . . .	11 11 0	March	12 1 0
December . . .	11 13 0	April/May . .	12 1 0

per ton for neutral quality guaranteed to contain 20·60 p.ct. of nitrogen by weight, and not to contain more than 0·25 p.ct. of free acid, and to be in readily friable condition at the time of delivery, delivered to consumer's nearest station or wharf in Great Britain (or f.o.b. British port when the ultimate destination is Isle of Man) for prompt cash payment in lots of 4 tons and upwards, packed in single bags containing about 2 cwt. net, to be supplied free to sellers, tare allowed. When credit is given, a reasonable extra charge may be made, but the discount allowed for prompt payment should be quoted on the invoice. The above prices will also apply to deliveries of 1 ton and upwards *ex*-works or *ex*-store to buyer's road vehicle."

A statement of conditions follows.

The sixth annual sports of the Bristol Gas Company Athletic Club were held on Saturday, July 17. Lady E. Davies distributed the prizes.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

SPECIAL ORDER.

Budleigh Salterton Gas Company, Ltd.

To extend the limits of supply, to make provisions as to price chargeable, to authorize the raising of further capital, to enable the Company to establish profit-sharing, and for other purposes.

Warrington Corporation.

To enable the Corporation to borrow further money for the purposes of the gas undertaking.

DECLARATION OF CALORIFIC VALUE.

Southport Corporation.—470 B.Th.U. (Nov. 1.)

PLANT EXTENSION AT SOUTHPORT GAS-WORKS.

Ministry of Health Inquiry.

At the Southport Town Hall, on Thursday last, an inquiry was conducted on behalf of the Minister of Health by Mr. R. C. Cox, M.Inst.C.E., into an application by the Southport Corporation for sanction to borrow £40,000 for the installation of new plant at the gas-works. The Town Clerk (Mr. J. E. Jarratt) appeared on behalf of the Corporation, and others present included Alderman Trounson, J.P. (Chairman of the Gas Committee), Mr. John Bond, O.B.E. (Gas Engineer), and Mr. A. Hobson (Borough Treasurer).

The TOWN CLERK said the application included an item of £1500 for a new showroom which the Gas Committee recently opened. It was originally contemplated in accordance with the application that this expenditure should be incurred out of capital. The Gas Committee, however, had paid the sum out of revenue, so that it might be taken that the item was withdrawn from the application. The main items in the application were for the improvement of the carbonizing plant. In 1912 the Corporation put up 40 new vertical retorts, and since that date the undertaking had been extremely successful. The manufacture of gas had increased by over 222 million c.ft. per annum. The Gas Engineer had come to the conclusion that it was desirable that the carbonizing capacity of the works should be immediately increased. There was, of course, for his consideration, the alternative of dealing with it by increasing storage capacity, but, although the gas estate had at the moment only a limited storage capacity, which was equivalent of half-a-day's winter supply of gas, the alternative of increasing storage capacity was one which involved so much capital, which, as compared with increasing the carbonizing plant, could not be said to be of a productive type, that the Gas Engineer had no hesitation in recommending that the way to deal with not only the present demand, but the contemplated increased demand, was to raise the productive capacity of the works in the manner proposed. The total working costs of production would be reduced by more up-to-date and efficient plant, and the price of gas, which was at present a low one in comparison with prices of other undertakings, would, under the proposal, in the end be substantially modified.

Mr. BOND said he had been Engineer and Manager of the Corporation gas-works for 22 years, and was a Past-President of the Institution of Gas Engineers. In 1912 the Corporation made their last improvement of the carbonizing plant, and the whole of the expenditure in respect of that had now been repaid. They considered the question of increased storage capacity very carefully. They had found that it would cost approximately £45,000 to put in 2,500,000 c.ft. capacity, and they had come to the conclusion that the money would be better spent on carbonizing plant. They could obtain a vertical retort installation for the manufacture of 2 million c.ft. of gas per day at a cost of approximately £35,000. He wanted the carburetted water gas plant solely as an auxiliary. The increase in the demand made on gas since their last extension had been 222,716,000 c.ft. In 1912, the gas manufactured was 548 million c.ft. and to-day it was 771 millions. The demand to-day in the winter time was about 3¼ million c.ft. per day, and the present output of the plant was 2 million c.ft. per day. The shortage was being made up by working the carburetted water gas plant at full capacity. The capital charge of gas per 1000 c.ft. was 4s. 4·6d. He had taken the returns of some 66 municipal concerns, and their average capital cost was 7s. 6d. per 1000 c.ft. of gas sold. Besides the carbonization plant, they proposed a clinker and coke separating plant. By putting down plant at a cost of some £1500, they would be able to save about £600 a year on this particular scheme. Then they proposed a coke handling and grading plant. This was for the domestic consumption of coke. Mr. Bond said they were selling gas to the ordinary consumer at 7·2d. per therm, *less* 5 p.ct. discount if paid within the month. This was a low price. He had taken out the returns from 350 gas undertakings, and the average price was 1s. per therm.

Information having been given by Mr. Bond on a number of other details relating to the application, the inquiry was closed.

Gas Profits at Dewsbury.—The County Borough of Dewsbury draft gas revenue account for the year ended March 31 shows a gross profit of £20,848; and after providing for interest and sinking fund, there is a net profit of £5608. During the year there has been a saving in the cost of manufacture of £6609, and an increased revenue by the sale of gas of £1759.

NORWICH SPECIAL ORDER INQUIRY.

Proposals of the British Gas Light Company, Ltd.

A public inquiry was held in the Council Chamber of the Guildhall, Norwich, on Tuesday of last week, by Mr. JAMES F. RONCA (Director of Gas Administration at the Board of Trade), into an application by the British Gas Light Company, Ltd., for a Special Order under section 10 of the Gas Regulation Act in respect of their Norwich undertaking.

The Order has for its object to confer various powers upon the Company; but the portion which gave rise to the main part of the discussion was that which seeks an extension of the Company's limits of supply (under conditions which were fully explained at the hearing) so as to embrace districts at present served by certain non-statutory gas companies. Another provision is to enable the Company to charge to the Norwich undertaking the capital cost of the acquisition and development of the Wymondham Gas Light and Coke Company, Ltd., or other undertakings.

Mr. AUBREY BEAUFOY WINSER (of Messrs. Sherwood & Co.) appeared for the British Gas Light Company; and there were with him Mr. A. W. BROOKES (the Secretary) and Mr. THOMAS GLOVER (Engineer of the Norwich Station). Mr. Henry Woodall (the Chairman of the Company) sent his regrets at his inability to be present, owing to the fact that he had had to leave for Copenhagen, on business relating to gas supply in Denmark. Mr. ALAN BELL (instructed by Messrs. Wilkinson & Davies) represented the North Walsham Gas Light and Coke Company, Ltd.; and Mr. H. C. DAVIES (the Clerk) appeared on behalf of the Norfolk County Council. The TOWN CLERK watched the proceedings in the interests of the Corporation of Norwich.

EXTENDED LIMITS OF SUPPLY.

Mr. WINSER, in opening, drew attention to the principal features of the Order, and to the Schedule indicating the extended limits of supply sought by the Company. He said that no objection had been taken in a general way to the extension of limits. The Corporation did raise a point; but this was only to make sure that any extension should not adversely affect the price of gas within the city. That objection had been met by the addition of the following proviso:

> Provided that the Company shall not supply gas within the added limits upon terms or at a price which would cause any increase in the price paid for gas by consumers within the existing limits or any part thereof or deprive those consumers of the benefit of any reduction in the price of gas which they might otherwise obtain.

In certain limited portions of the extended area now under consideration there were at the present time unauthorized undertakings supplying gas; and the clause, which had been framed with a knowledge of their existence, provided that:

> The Company shall not supply gas within any part of the parishes mentioned in the first column of the Second Schedule to this Order so long as the body or persons mentioned in the second column thereof or their successors in business shall provide a continuous supply of gas to the inhabitants of the respective parishes save with the consent of such bodies or persons respectively or their successors in business.

SECOND SCHEDULE.

Parish.	Undertaking.
Attleborough	Attleborough Gas Company, Ltd.
Aylsham	Aylsham Gas Company, Ltd.
North Walsham	North Walsham Gas Light and Coke Co., Ltd.
Mundesley	Mundesley and Holt Gas Company, Ltd.
Knapton	Mundesley and Holt Gas Company, Ltd.
Loddon	Loddon Gas Consumers' Company, Ltd.
Chedgrave	Loddon Gas Consumers' Company, Ltd.

Of the five unauthorized undertakings mentioned in the Second Schedule, objections were lodged by two, and one only appeared to be heard at the inquiry.

OTHER CLAUSES.

By the next clause the Company sought to charge as expenditure on capital account on the Norwich undertaking all moneys expended by them in the acquisition and development of the undertaking, property, or business of the Wymondham Gas Light and Coke Company, Ltd., or in the acquisition of any other gas undertaking, property, or business within the added limits. The purchase of the Wymondham Company was made by the parent Company; and the desire now was to charge the money involved to the undertaking at Norwich, so that the purchase should form part of that undertaking. In the first instance, objection was taken to this by the Norwich Corporation; but it had since been withdrawn. Clause 6 provided that the price of gas in the added area should be the same as that in the outer area of the existing limits; and by clause 7 the Company sought statutory power to manufacture and store gas and work-up residual products on lands which had been purchased by them, and which had been in the past used for the purpose of manufacturing gas, but without statutory authority. The intention of the Company was not, he understood, to manufacture gas there, but to use the site for storing and boosting gas. At the present time gas was being sent from the Norwich manufacturing plant. The next clause gave power to purchase additional lands by agreement. He thought he was correct in saying that at present the Company, so far as their Norwich undertaking was concerned, had no power to acquire lands by agreement, other than those which were scheduled to their various Acts and Orders; and they asked by this clause for authority to acquire land not exceeding in the whole 10 acres for general subsidiary purposes, which did not include the manufacture of gas. The Norwich Corporation raised a point on this, but the objection had been met. An amendment had been added which gave the Corporation such rights as owners would have if they owned property within 300 yards of the lands concerned. In the next clause the Company took power, as they might think fit, to make up their balance-sheet to Dec. 31 or June 30.

Then in clause 10 they had a model form of clause empowering the Company to supply gas or to take gas in bulk; and to meet an objection that was raised, the Company had added the following:

> Provided that the Company shall not supply gas under any such contract beyond the limits of supply if and so long as such supply would interfere with the supply of gas within those limits.

Clause 16, "Relief from obligation to supply," had been objected to by the Corporation, but the objection was not being pressed. It was in modified form what used to be a model clause, and it was aimed at giving the Company relief in certain circumstances from the statutory obligation to supply gas when it was demanded by a new customer. Clause 17, "As to construction and placing of pipes, &c."—which was to enable the Company to ensure a satisfactory supply of gas to their consumers—was also a very usual form of clause; but it was objected to by the Railway Company, whose objection was met by the addition of a stipulation that:

> The provisions of this section relating to pipes and the fittings thereof shall not apply to any pipes or fittings belonging to a railway company or railway committee and laid or placed, or intended to be laid or placed, in any premises (not being a dwelling-house or premises appurtenant to a dwelling-house) of that company or committee
>
> (*a*) elsewhere than between the main of the Company and the meter, or
>
> (*b*) between such main and the meter unless and except so far as such pipes or fittings are covered over or intended to be covered over.

THE NORTHAMPTON CLAUSE.

Turning to the objections raised against the Order, Mr. Winser dealt first with that of the Norfolk County Council. The Council asked, he said, for additional protection with respect to county bridges within the proposed area of supply, in the form of a provision that if any county bridges required at any future time alteration or reconstruction the removal and relaying of any gas mains should be carried out at the cost of the promoters. As to this, his contention was that the position of highway authorities had recently become stabilized. In November last the Northamptonshire County Council sought to make a test case, in order to establish what were the rights of highway authorities in connection with a public utility undertaking. The matter was then discussed at great length before a House of Lords Committee, with the result that the Committee decided that the general protection given by the Gas-Works Clauses Act, 1847, was sufficient, and that the only protection to which the County Council were entitled was a very minor and trivial concession which the promoters had, indeed, offered to give them. The Company felt in this case that, as that was the latest decision of Parliament, they had no alternative but to say they would be willing to give such protection to the Norfolk County Council as Parliament had decided should be given in the case of the Northamptonshire County Council. The Company regarded it as useless to discuss the matter further. They did not feel that they could depart from what Parliament had found was the proper protection to give to a highway authority.*

Mr. RONCA: I shall need a good deal of convincing to get away from the Northampton decision.

Mr. DAVIES said the position was that, with the increase in modern methods of transport, the County Council were every year requiring to reconstruct a great number of county bridges; and if only the money was available, they would be proceeding with this work even more quickly. Where the moving of electric cables or gas mains was involved, the Council did not see why they should be put to additional expense. The cables or mains were there for the purpose of obtaining a profit, and so their presence should not involve an increased burden on the ratepayers. In Electricity Orders they had had a clause agreed. He did not accept the statement that the matter was stabilized to-day, because it was still under discussion. The clause agreed to by the promoters of Electricity Orders could be also agreed to by the gas companies.

Mr. WINSER replied that they must accept the position as it appeared to-day. Undertakers were in the hands of the particular Department to which their application might be made; and the case of an Electricity Order did not affect the matter now under discussion.

THE CASE OF NORTH WALSHAM.

Proceeding, Mr. Winser referred to the objection lodged by the North Walsham Gas Light and Coke Company, Ltd. That Company objected to the inclusion of the urban district of North Walsham within the British Gas Light Company's limits. They urged that the urban district was now, and had been, furnished with an ade-

* The proceedings before the House of Lords Committee on the Northampton Gas Order will be found reported in the "JOURNAL" for Dec. 2, 1925, (p. 595), and Dec. 16 (p. 737).

quate and continuous supply by them. They might have modelled their undertaking on lines laid down by gas legislation; but they were, of course, under none of the obligations imposed by that legislation. Consumers had no right to demand a supply. The North Walsham Company asked that the urban district in which they supplied gas should be deleted from the Order.

Mr. BELL said he was prepared to contend that this particular Order which was asked for by the British Gas Light Company was not such an Order as ought to be made by the Board of Trade under existing Gas Acts or legislation. Of course, the Board of Trade had complete powers; but on the proper construction of the Gas Regulation Act he held that they ought not to make the Order.

Mr. WINSER said there could be no question of the powers of the Board of Trade. It might contravene the intentions of gas legislation if one super-imposed one statutory area upon another; but such a case would not be on all fours with the one now before them, where they were dealing with an unauthorized undertaking having no area and no statutory rights, so far as gas legislation was concerned. Gas legislation took no cognizance whatever of such an undertaking. It was contended by this Company that the proposals were unnecessary, unfair, and oppressive, inasmuch as there was no provision for the protection of the Gas Company's interests. The promoters had asked the Company what sort of protection they would like. Then the North Walsham Urban District Council had raised objections which were intended to support mainly those of the Gas Company. The Council said they had been satisfactorily supplied by the North Walsham Company; and they considered the proposal in the Order to which they objected as both unnecessary and inexpedient. The Loddon Gas Consumers' Company, Ltd., had also lodged an objection to the Order; but as they were not represented at the inquiry, he did not propose to take up time over their objection.

Mr. *A. W. Brookes* (Secretary to the British Gas Light Company) said the inclusion of the large area in the Order did not necessarily mean that the Company would extend all over it. They would extend to these areas gradually, as it became an economic proposition to do so. The present works at Norwich were capable of meeting any demands that might arise from extension to the new area. The Norwich Works had of recent years been considerably enlarged. In fact, the Company had spent over £200,000 on extending them. The outputs of the five undertakings mentioned in the Schedule ranged between 4 and 12 million c.ft. a year; whereas that of the Norwich undertaking was over 800 millions. All through, the intention of his Company had been not to inconvenience these non-statutory undertakings; and it was felt that the Order would not prejudice them in any way. He felt certain his Directors would be prepared, if it would meet the objection of the North Walsham Company, to leave out the word "continuous" from the proviso already quoted, relating to these unauthorized companies. Since his Company took over the Wymondham Works, the output of gas had substantially increased. In fact, their extension to that area had been beneficial both to themselves and to the consumers in that area. Frequently small undertakings could not themselves afford the initial capital expenditure required to provide extensions for would-be consumers of gas.

Mr. BELL (in cross-examination): Who is to determine when the North Walsham Company are supplying gas, or when they are not?

Witness: It is a question of fact. You are either supplying or you are not.

Supposing someone in our area says: "Supply me with gas," and the North Walsham Company reply, "We cannot do it for financial reasons," will you come along and say: "North Walsham, you are not supplying gas; you have broken the condition, and we ourselves are going to supply gas?"—We mean when your Company cease to supply gas. So long as you are lighting this place, we should not think of intruding on your ground without coming to an agreement with you.

Where does that appear in the Order? There is nothing there as to who is to decide.—We have endeavoured to put the matter plainly. We do not wish to come into your area so long as you are supplying gas there, except with your consent.

Re-examined: He had no doubt it was possible to determine whether an undertaking was supplying gas or not. If a gas company were functioning, there was a gas supply; and if they were shut down, there was no gas supply. This was his Company's meaning. It would be possible to have some independent person who would decide whether or not the works were functioning.

Mr. WINSER: If it were said that the Board of Trade should decide, would your Company object?

Witness: Not in the slightest.

Mr. BELL said he appeared also on behalf of the North Walsham Urban District Council, and he was prepared with evidence to show that the public need for gas in that area was now, and always had been, satisfied. He did not know whether it was necessary to call this evidence.

Mr. RONCA: I should have thought that the relevant evidence was not so much what has been done—because I have gathered it is admitted that a satisfactory supply has been given—but what assurance there is that the supply will continue to be satisfactory.

Mr. WINSER: We have no information either adverse to or in favour of the Company.

Mr. BELL remarked that it would perhaps be better if he called his evidence.

Mr. *L. W. Burton* (Chairman of the North Walsham Urban District Council) said he considered that the Company gave an absolutely satisfactory supply. He had no complaint whatever to make regarding it.

Mr. *H. N. T. Empson* (Clerk to the North Walsham Urban District Council) stated that he had known the place all his life, and the Gas Company had always given an adequate supply in the most thickly populated part of the town. As building had been carried out, the mains had been extended to meet the demands. The Council were satisfied with the work that had been done by the Company.

Mr. *J. A. Ogilvy*, resident for the last eighteen years in North Walsham, and Managing Director of a steam laundry there, which was supplied with gas by the Company, said the Company had always been most attentive in meeting his demands. In other directions, also, the Company had displayed readiness to meet new demands.

Mr. *A. Walker* (who had lived in North Walsham for fifty years, and had been a member of the Urban District Council for thirty years) stated that in the past the Company had met the demands upon them, and they should be able to do so in the future. He did not see the need for any change in this respect.

Mr. *John Dixon* (Secretary and Manager of the North Walsham Gas Company) gave evidence to the effect that in the past fourteen years the population of the town had decreased slightly—from 4254 in 1911, to 4155 in 1925. It was an agricultural area; and speaking from lifelong experience of the district, he did not anticipate any great increase in population. The Company were formed in 1839. Since 1891 there had been a considerable sum of money spent in improvements; and the undertaking was in a satisfactory financial position. Last year the dividend was 4½ p.ct., and the year before that 5 p.ct. He saw no reason why the Company should not continue to be able to meet demands. With their plant they could supply twice as much gas as they were doing at the present time.

In cross-examination, witness was closely pressed to say how his Company would be prejudiced by the proposals of the British Gas Light Company, and finally he said that if anyone else came along and offered them a good price for their undertaking they would be prevented by the Order from accepting the offer. The Urban District Council might desire to purchase the works.

Mr. WINSER: Would it remove your apprehensions in that respect if the Urban District Council were given power to do so?

Witness: The Company might desire to sell the works to someone else, and they could not if their hands were tied.

Mr. WINSER: The Order provides that the British Gas Light Company shall not come into your district so long as you "or your successors in business" continue to supply gas.

Further cross-examined, witness said the number of consumers was now 349; and the price of gas 6s. 8d. per 1000 c.ft., though it had in past years been a good deal cheaper than this. The capital of the Company was £6000 in ordinary shares; and there were £3000 of debentures. The output of gas in 1925 was just over 8½ million c.ft. There had been no break-down in the supply within living memory.

Mr. BELL contended that so far as the Order related to North Walsham it was misconceived. When the Order was applied for it was quite clear that the needs of the district were not thought of at all. The Company simply decided to extend their area abroad over Norfolk. By the terms of the Order, the British Gas Light Company themselves were prepared to allow the present state of affairs to continue indefinitely. Evidently, therefore, they had nothing to urge against the efficiency of the North Walsham Company; and it was the needs of the public that had to be considered first. Obviously unauthorized gas undertakings were legally possible and were contemplated, for the simple reason that other undertakings which supplied gas enjoyed privileges. Unauthorized undertakings did not enjoy these privileges; but they could still carry on business, and there was nothing to take away their ordinary common law rights. An authorized undertaking, so long as the needs of the inhabitants were being adequately catered for, had no right to come before the Board of Trade and say: "We ought to be regarded as being in a superior position, so far as the needs of the inhabitants are concerned, because we have conformed to the regulations." When the Legislature was contemplating the extension of the areas of undertakings, it never intended that one supplier should overlap another. There had been instances in which Parliament had allowed one undertaking to enter on the area of another, but only when a specific agreement had been drawn up beforehand between the two parties. Parliament had also allowed it where gas of a different kind, for power purposes, was to be supplied. The British Gas Light Company should not come and ask a Government Department to allow them to encroach on the North Walsham Company's area unless there was some vital need of the public which required this to be done. No harm could possibly be done, he submitted, if the North Walsham Company were cut out of the Order.

Mr. WINSER replied that the Order had been promoted in a manner which, in the view of the British Gas Light Company, was fair to all concerned. The inference they drew from the fact that only one out of the five Companies concerned appeared in opposition was that they had succeeded. The promoters were quite prepared to let the Board of Trade arbitrate, if they would, and say whether in fact a supply of gas was being afforded. If the drafting of the Order could be said to be vague, it was at least based on a precedent which the Board of Trade had approved. In the Wirksworth Gas Order of 1924, there would be found almost identical wording to meet a similar situation. Nothing had arisen in the whole of the proceedings to show that the North Walsham Company would be in the slightest degree trammelled. The Company would not enter the limits of the urban district without agreement, thus allowing the North Walsham Company considerable scope for development. If, as suggested, North Walsham were eliminated from the Order altogether, it would remove the possibility of the British Gas Light Company supplying by bulk or otherwise in North Walsham, if the local Company ceased business or found it an economical proposition to take a bulk supply. It was therefore in the public interest that the facilities proposed should be provided. If the area were excluded, it would also be more inconvenient to the British Gas Light Company in extending their mains towards the sea.

The inquiry then closed.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

Market conditions in the Midlands are not seriously strained. Prices are at a point which is too high for economic production in industries which depend largely on coal. Only those manufacturers who have pressing commitments or are able to cover increased costs by selling their goods on an emergency basis, can afford to pay the prices. Uncontrolled supplies can be got at about 30s. The outcrop fuel to which this price relates is generally of poor value, however, and is only serviceable as a stop-gap.

For some of the coal which is now being got from district pits, as much as 45s. is asked, and then it is delivered unscreened. Manufacturers state that 54s. is about the lowest figure at which they can obtain Westphalian or Polish coal. Apart from its high price, the quality is said to be very variable, and it is only bought in the last resort.

American coal is now coming to the rescue of gas undertakings whose reserves are running low. Some precautionary purchases have likewise been made for works like those at Birmingham which have still a month's stock on hand. Consumers are, however, urged more peremptorily to economize in view of the exhausting effects of a three months' hold-up.

Miners in the Midland area have been vacillating in their attitude to the proposals for a resumption on the basis of an eight-hours' day.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The key industries of the country continue to obtain all their requirements of foreign coal, which, on the average, is giving complete satisfaction. Purchases have been made for some time ahead, and should the dispute continue there will evidently be no shortage. Prices are slightly in advance, as compared with last week's figures, owing to the congestion prevailing at certain discharging ports.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *July* 31.

There is no change to report in the position of tar products, and the prices generally are about the same as last recorded.

Tar Products in the Provinces.

July 31.

Markets for tar products have remained steady, although the products are somewhat neglected, principally owing to the strike and slackness at this time of the year.

In pitch, no sales of importance are reported.

Creosote is firm, and there is a fair inquiry for both benzole and white naphthas.

The average values for gas-works products during the week were: Gas-works tar, 61s. to 66s. Pitch, East Coast, 87s. 6d. to 90s. f.o.b. West Coast—Manchester, 82s. 6d. to 85s.; Liverpool, 85s. to 87s. 6d.; Clyde, 88s. to 89s. Benzole, 90 p.ct., North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6⅝d.; salty, 6⅜d. to 6½d.; Scotland, 6d. to 6¼d. Heavy oils, in bulk, North, 7¼d. to 7½d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts £4 10s. to £5, bags included. Anthracene "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

TRADE NOTES.

Renold Chains for Industrial Operations.

Messrs. Hans Renold, Ltd., of Didsbury, Manchester, have introduced a complete new series of "Duplex" chains to meet the demand of space limitation and compactness of drive. The firm's price list for 1926-27 shows substantial price revisions.

Art Metal Surrounds.

A neat booklet in which are illustrated some of the artistic metal mantelpieces and surrounds manufactured by F. Turner, of 61, 62, & 63, Summer Hill Street, Birmingham, has just been published.

Portmadoc Gas Price Increase.—In view of the increase in the cost of coal, the Portmadoc Urban District Council have raised the price of gas from 6s. 5d. to 6s. 8d. per 1000 c.ft.

Disposal of Tar at Leeds.—In a paragraph on p. 92 of the "Journal" for July 14, it was erroneously stated that negotiations had been authorized for the sale of the tar produced at the Leeds Corporation Gas-Works to the Gas Light and Coke Company. The sale of the tar is being made to the Yorkshire Tar Distillers, Ltd.

Stafford and Centralization of Accounts.—After a long discussion, the Stafford Town Council decided, by 19 votes to 10, to refer back a proposal submitted by the Finance Committee, as the result of an inquiry by a Reorganization Sub-Committee into a report by Mr. Arthur Collins, with regard to the centralization of the accounts, instead of treating each department as a separate business. One member argued that centralization would rob the Gas Department of the great asset it now possessed in the combined office and showroom.

Gas v. Atmospheric Pollution.

In his annual report on the public health of the City of Birmingham, Sir John Robertson, C.M.G., the Medical Officer, deals at length with the smoke nuisance and its effects. He mentions the good work of the Gas Department, who now supply gas to no fewer than 2357 engines, with a total horse-power of 51,233. Formerly much of the work done by these engines was done by steam boilers. In regard to domestic heating, there are 83,000 gas fires, and 185,000 gas cookers in use in the city. "It can be easily imagined," says Sir John Robertson, "what the effect of returning to the old-fashioned method of cooking by coal ranges would be in regard to the production of smoke." In 1925, 11,529 gas fires and 6583 cookers were fixed by the Gas Department, who, at the instigation of the Public Health Department, are endeavouring to enable the dwellers in the smallest houses in the city courtyards to use gas for cooking.

Gas Company and Electricity Supply.

In the Ulster Chancery Court, Belfast, Mr. Justice Wilson granted a petition on behalf of the Cookstown Gas and Light Company, Ltd., to make an alteration in the memorandum and articles of association to enable them to manufacture and supply electricity as well as gas. The Company was formed in 1900, with a nominal capital of £10,000, to carry on the operations of the gas undertaking. In October, 1925, it was decided to seek powers to extend the activities of the concern in recognition of the growing demand for a supply of electricity in Cookstown and neighbourhood. A few people had already installed their own electrical plant; a number of others were about to commence a company for the purpose of supplying electric power and light within and beyond the urban area. Petitioners then decided, in order to protect their property and assets, to meet this demand for power and light. An application was made to the Electricity Commissioners, who, on Aug. 2, 1925, gave leave to erect a generating station. This had since been erected. No one, it was stated, could be prejudiced by the proposed extension.

Camborne Public Lighting.—The Camborne Gas Company have just secured the contract for the public lighting of the town and district for a period of ten years. The local electricity company's tender was £69 a year above that of the Gas Company.

Metropolitan Gas Company of Melbourne.—Messrs. John Terry & Co., of 7, Great Winchester Street, E.C., have received a cablegram from their principals, the Metropolitan Gas Company of Melbourne, informing them that the net profits for the six months to June 30 last were £113,400. A dividend of 7s. 6d. per share has been declared, £27,400 has been transferred to reserve account, and £78,100 has been carried forward. Dividends will be payable in Melbourne probably on Aug. 2, and those to absentee shareholders will be posted by an early mail.

Birmingham Corporation Accounts.—The accounts of the Birmingham Corporation for the year ended March 31 (with a copy of which we have been favoured by Mr. J. R. Johnson, F.S.A.A., the City Treasurer) show that, of the total sum of £45,000,000 raised to that date, the large amount of £22,500,000 was in respect of Corporation-owned revenue-earning utilities. Of this, the gas undertaking was responsible for £3,510,604. The gas profits for the year carried to the borough fund amounted to £41,200. The total revenue of the undertaking was £2,395,870, and the working expenses £2,123,817—leaving a gross profit of £272,053. Deducting £185,656 for loan charges, there remained a net profit of £86,397, of which £45,197 was carried to special expenditure account. The sum standing to the credit of the reserve fund at the end of the financial period was £2672.

Welsbach Light Company, Ltd.—At the general meeting of the Company, which was held to-day, reference was made to the Safeguarding of Industries (Customs Duties) Act, imposing, *inter alia*, duties upon importation from all countries of mantles and certain materials for their manufacture. The period preceding the Act, it is mentioned, was marked by a heavy influx of cheap mantles into this country. In the face of this fact, and notwithstanding the difficulties of trading thus caused, the Company have been able to carry to the credit of profit and loss account (incorporating the trading results of the subsidiary Company, which, in the preceding year, incurred a loss of nearly £7000) a balance representing an improvement on the aggregate result of the two Companies in the preceding year. The balance to the credit of profit and loss account was £3021, making, with the balance brought forward from last year, £23,495. Out of this the Board recommended the payment of a dividend of 5 p.ct. (less income-tax) on the issued share capital. This will absorb £12,896, leaving £10,599 to be carried forward.

Proposed Showrooms at Bingley.—The Bingley Urban District Council, having secured certain valuable central land in the town, proposes to erect thereon, among other things, a showroom for the Gas Department; but there is some local opposition. A Ministry of Health inquiry was held at Bingley into the matter on July 20. The Bingley Chamber of Trade, the Bingley Ratepayers' Association, and the Bingley Conservative Club opposed. The Clerk to the Council (Mr. H. O. Hilary) stated that the present showrooms, which are temporary, are at the gas-works, hidden away from public sight. The success of this proposal would mean a reduction in the price of gas. Mr. T. Snowden, Chairman of the Council's Finance Committee, described the proposed showroom as an essential part of the Gas Department. Mr. J. Clark, Chairman of the Lighting Committee, did not anticipate that the scheme would affect the rates at all. The opposition was on grounds of economy. Mr. T. Snowden suggested that the opposition was not entirely "disinterested," meaning no doubt that the traders objected to the possibility of municipal trading from the showrooms. The Inspector closed the inquiry and afterwards viewed the site.

STOCK MARKET REPORT.

WITH the holiday season in full swing, it was not to be expected that there would be much activity on the Stock Exchange last week. The French financial conditions occupied considerable attention; but while authority had been obtained by the new Cabinet to raise additional revenue, the position, in view of the indefinite nature of the financial proposals, is still uncertain, and the franc, after improving to 187½, fell back gradually to as low as 211½.

The stock markets generally were unexciting. Outside conditions continue to be unfavourable, and other disturbing factors occurred during the week. Home Rails were naturally affected by the dividend announcements; and tobaccos were weaker in consequence of the rumours of a competitive war. The closing of the Courtaulds Essex factories had a bearing influence on the shares.

The transactions in the Gas Market were as heavy as during the previous week, and there were some improvements in values, particularly the 6½ points in the Imperial Continental capital stock. Gas Light ordinary advanced 1½ points, and Commercial 4 p.ct. 1 point. The close proximity of dividend distributions possibly account for these; but the emergency regulations issued by the Board of Trade under the Gas Regulation Act, if they do not bring about an improvement in values, will at least tend to maintain them. These regulations are intended to give companies relief, by enabling them to obtain a temporary revision of standard prices which are endangered by the necessity of purchasing foreign coal at greatly enhanced prices.

The following transactions were recorded during the week:

On Monday, Bombay 20/4½, Brighton and Hove 170, Bristol 84, British 101, 102, Commercial 4 p.ct. 79, 3½ p.ct. 77, 78½, Gas Light and Coke 83⅞, 84¼, 84½, 84⅞, 85, 85½, 85⅞, 3½ p.ct. 58½, 58¾, 4 p.ct. preference 76, Hong Kong 20¼, 20⅜, Imperial Continental 114, Primitiva 9s. 6d., South Metropolitan 93, 93¼, 93¾, South Suburban 5 p.ct. 99, Wandsworth, Wimbledon 5 p.ct. 100½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99, Hornsey 4 p.ct. debenture 73, Liverpool 5 p.ct. 81⅝.

On Tuesday, Bahia-Blanca 1s., Commercial 4 p.ct. 79½, 79½, 3½ p.ct. 77⅞, European 92s. 6d., Gas Light and Coke 84⅛, 85, 85¼, 85½, 85⅝, 85⅞, 86, 86¼, 3½ p.ct. maximum 58¾, 59, 4 p.ct. preference 76, 3 p.ct. debenture 58½, 59¼, Imperial Continental 115½, 116, 118, 119, 120, Lea Bridge 5 p.ct. 98½, Primitiva 9s. 6d., 9s. 9d., South Metropolitan 93½, Swansea 7 p.ct. preference 102, Wandsworth, Wimbledon 5 p.ct., 100½, 101. Supplementary prices, Croydon 4 p.ct. debenture 71½, Gas Light and Coke 5 p.ct. debenture 99, Romford "B" 8⅛, 8⅜.

On Wednesday, Alliance and Dublin 79, Brighton and Hove 170, "A" 132½, Commercial 4 p.ct. 77⅞, 79¼, 79¾, Gas Light and Coke 84, 85, 85⅜, 85¼, 85⅝, 85¾, 86, 86¼, 3½ p.ct. maximum 59¼, 59⅜, 3 p.ct. debenture 58¾, Imperial Continental 120, 121, Lea Bridge 99½, South Metropolitan 93¾, 93⅞, South Suburban 5 p.ct. 99, Swansea 7 p.ct. preference 103, Tottenham "A" 108½, 4 p.ct. debenture 74. Supplementary prices, Brighton and Hove 5 p.ct. debenture 94½, 4 p.ct. "C" preference 68, 69⅜, Gas Light and Coke 5 p.ct. debenture 99, Oxford 5 p.ct. 128.

On Thursday, British 103, Cardiff 96½, Commercial 4 p.ct. 78½, 80, 3½ p.ct. 76½, Gas Light and Coke 85¼, 85½, 85⅜, 86, 86¼, 3 p.ct. debenture 59½, Imperial Continental 119, 120, 121, Primitiva 9s. 10½d., South Metropolitan 93½, 93⅜, 3 p.ct. debenture 58½, South Suburban 5 p.ct. 98¼, 99, 100, 5 p.ct. debenture 93, Tottenham "B" 88½, 89½. Supplementary prices, Barnet 4 p.ct. 75, Danish 7½, Gas Light and Coke 5 p.ct. debenture 99, Oxford 5 p.ct. 128½, Sunderland 6 p.ct. maximum 98¼, Tunbridge Wells 4½ p.ct. debenture 80.

On Friday, Croydon sliding-scale 97⅛, Gas Light and Coke 85¼, 85⅜, 86, 4 p.ct. preference 77, 77½, Hong Kong 20⅛, Imperial Continental 118½, 119, Primitiva 9s. 6d., South Metropolitan 94½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99, Liverpool 5 p.ct. 80½, Mid-Kent 55s. 3d.

Money was in good demand in Lombard Street, and 4 p.ct. was obtained for both old and new loans. Although balances changed hands at a slightly lower percentage at the close, these transactions were few. The discount market was steady, but hardened on the result of the Treasury Bill tendering. Applications were heavier than usual, and the average rate was nearly 1s. 6d. p.ct. higher than the previous week at £4 7s. 0·29d. p.ct. —the highest rate since May 14.

In the Foreign Exchange Market, the Continent, especially Holland, was a seller of francs. The Paris cheque, after touching 204, closed practically unchanged at 201¼. Belgian francs recovered slightly, and finished at 190½. Italian lire were weaker, the closing quotation being 151 against 148½ on the previous day. Sterling on New York was a little easier at 4.86$\frac{31}{32}$.

Silver was very dull, and the price fell to 29$\frac{7}{16}$d. Gold rose ½d. to 84s. 11½d., the supplies not being equal to the demand.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. July 30.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. C.	74—77	..	..
332,992	,,	,,	4	4	Do. 4 p.c. Pref.	67—72	..	..
1,551,868	,,	Apl. 1	6¼	6¼	Alliance & Dublin Ord.	75—80	..	79
874,000	,,	July 8	4	4	Do. 4 p.c. Deb.	60—65	..	..
800,000	1	May 6	1/7⅛	1/7⅛	Bombay, Ltd.	1$\frac{15}{16}$—1$\frac{31}{32}$	..	20/4½
170,000	10	Mar. 4	8½	8½	Bournemouth 5 p.c.	12—13	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 24	3	3	Do. 3 p.c. Deb.	54—57	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
214,740	,,	Mar. 18	12	12	Brighton & Hove Orig.	167—172	..	170
244,200	,,	,,	9	9	Do. A Ord.	128—133	..	132½
1,287,500	,,	July 22	5	5	Bristol 5 p.c. max.	86—87*a*	..	84
855,000	,,	Mar. 18	8	7	British Ord.	99—104	..	101—103
100,000	,,	June 24	7	7	Do. 7 p.c. Pref.	114—119	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	68—73	..	..
100,000	10	June 10	6	8	Cape Town, Ltd.	6¼—7¼	..	..
100,000	10	Apl. 22	4½	4½	Do. 4½ p.c. Pref.	6¼—7½	+⅛	..
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb.	66—71	..	..
626,880	,,	July 22	6	6	Cardiff Con. Ord.	94—97*	..	96½
237,880	,,	June 24	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Mar. 4	5	6½	Chester 5 p.c. Ord.	87½—92½*b*	..	..
79,185	1	Apl. 22	†2/-	†2/-	Colombo Ltd. Ord.	28/—30/-	..	..
24,495	1	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/—22/-	..	..
1,513,280	Stk.	Mar. 4	5⅜	5⅜	Commercial 4 p.c. Cap.	78—81	+1	77⅜—80
560,000	,,	,,	5/3/4	5/3/4	Do. 3½ p.c. Cap.	76—79	−1	76½—78½
475,000	,,	June 24	3	3	Do 3 p.c. Deb.	54—57	..	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	25—30	..	..
200,000	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	..
737,150	,,	Mar. 4	6½	6½	Croydon sliding scale	95—98	..	97⅛
403,100	,,	,,	5	5	Do. max. div.	79—83	..	..
492,270	,,	Mar. 4	6	9	Derby Con.	107—109*c*	..	..
55,000	,,	June 24	4	4	Do. Deb.	73—75*c*	..	..
209,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
50,000	,,	June 24	5	5	Eastbourne 5 p.c. Deb.	91—96	..	..
1,002,180	10	Apl. 1	†6	†4	European, Ltd.	4—5	..	4⅜
18,788,960	Stk.	Feb. 18	5⅛	4/17/4	Gas Light & Coke 4 p.c. Ord.	84⅛—86⅛	+1⅛	83⅜—86⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	..	58⅛—59⅜
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—79	..	76—77⅛
5,602,630	,,	June 24	3	3	Do. 3 p.c. Con. Deb.	58—61	..	58½—59⅛
181,315	,,	,,	—	—	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	..
130,000	,,	—	10	10	Do. 10 p.c. Bonds.	..	..	..
42,000	,,	—	7⅛	7⅛	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 18	6⅜	6⅜	Hastings & St L. 5 p.c. Conv	88—93	..	..
258,740	,,	,,	5⅞	5⅞	Do. 3½ p.c. Conv.	68—73	..	..
70,000	10	June 10	†10	†10	Hongkong & China, Ltd.	19½—20⅜	..	20⅛—20⅜
173,200	Stk.	Mar. 4	5	5	Hornsey Con. 3½ p.c.	69—71	..	..
1,976,000	,,	May 20	10	†10	Imperial Continental Cap.	117—122	+6½	114—121
226,170	,,	Feb. 4	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 18	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	98½—99½
2,127,340	,,	Feb. 18	5½	5½	Liverpool 5 p.c. Ord.	80¼—81½*b*	..	80½—81⅛
600,000	,,	Mar. 18	7	7	Do. 7 p.c. Red. Pref.	102¼—104½*b*	..	..
165,736	,,	Feb. 18	9	8	Maidstone 5 p.c. Cap.	115—120	..	..
63,480	,,	June 24	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	June 24	†6	†7	Malta & Mediterranean	5¼—6¾	..	..
541,920	Stk.	May 20	†4	†6	Montevideo, Ltd.	76—79	..	..
2,061,315	,,	Mar. 4	5	5	Newcastle & Gateshead Con.	70½—71¼*d*	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	74½—75½*d*	..	..
529,705	,,	June 24	3½	3½	Do. 3½ p.c. Deb.	68—69*d*	..	..
15,000	,,	Mar. 4	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91,530	,,	,,	8$\frac{9}{20}$	8$\frac{9}{20}$	Do. 7 p.c.	112—117	..	..
300,000	Stk.	May 6	9	7	Oriental, Ltd.	96—101	..	..
188,120	,,	June 24	7⅛	7⅛	Plym'th & Ston'house 5 p.c.	108—113	..	..
60,000	50	Mar. 4	14	14	Portsea Island B	90—95	..	..
100,000	50	,,	13	13	Do. C	88—93	..	..
2,289,909	1	,,	—	—	Primitiva Ord.	9/3—10/3	..	9/6—9/10½
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	83—85	..	..
600,000	Stk.	July 22	4	4	Do. 4 p.c. Red. Deb. 1911	65—67*	..	..
180,305	,,	June 24	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	..
256,847	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	..
150,000	10	Mar. 18	6	6	San Paulo 6 p.c. Pref.	72—8½	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	44—47	..	..
270,000	Stk.	Mar. 18	5½	6	Sheffield A	98—100*e*	..	..
419,968	,,	,,	5½	6	Do. B	98—100*e*	..	..
1,047,000	,,	,,	5½	6	Do. C	98—100*e*	..	..
90,000	10	June 11	4	—	South African	5—7	..	..
6,609,895	Stk.	Mar. 4	5	7	South Met. Ord.	92½—94½	..	93—94½
1,895,445	,,	July 8	3	3	Do. 3 p.c. Deb.	57—60	+2	58½
734,000	,,	Mar. 4	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	..
91,500	,,	Mar. 4	8½	8½	South Shields Con.	117—119*d*	..	..
1,187,795	,,	Mar. 4	6½	6½	South Suburban Ord. 5 p.c.	98—101	..	98½—100
368,837	,,	June 24	5	5	Do. 5 p.c. Deb.	92—95	..	93
647,740	,,	Mar. 18	5	5	South'mpton Ord. 5 p.c. max.	77—80	..	..
121,275	,,	June 24	4	4	Do. 4 p.c. Deb.	68—73	..	..
250,000	,,	Mar. 4	7	7	Swansea 7 p.c. Red. Pref.	100—103	..	102—103
300,000	,,	June 24	6½	6½	Do. 6½ p.c. Red. Deb.	99—101	..	..
120,000	,,	July 22	7½	7½	Tottenham District A 5 p.c.	105—110*	..	108½
882,275	,,	,,	5½	6½	Do. B 3½ p.c.	87—90*	..	88½—89½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	99—101*	..	..
181,255	,,	June 10	4	4	Do. 4 p.c. Deb.	73—76	..	74
258,251	,,	Mar. 18	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	67½—68½*d*	..	..
197,294	,,	Mar. 4	6⅝	6⅝	Do. 5 p.c. pref.	90—95	..	..
88,230	,,	,,	5	5	Do. 5 p.c. Maidenh'd	82—87	..	..
91,800	,,	,,	6⅝	6⅝	Do. 5 p.c. Maidenh'd	87—92	..	..
80,000	,,	July 8	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	122—127	..	..
255,836	,,	,,	7	7	Do. B 3½ p.c.	102—107	..	..
412,450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	..
352,000	,,	,,	6⅝	6⅝	Wimbledon 5 p.c.	98—103	..	100½—101
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.	104—109	..	..
88,416	,,	June 24	3	3	3 p.c. Deb.	54—57	..	..

Quotations at:—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *Ex. div.
† Paid free of income-tax. ‡ Plus 8½ p.ct. p.a. special dividend.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words), 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER.
United Kingdom & Ireland	Advance Rate:	35/-	18/-	10/-
	Credit Rate:	40/-	21/-	11/6
Dominions & Colonies & U.S.A Payable in Advance		35/-	—	—
Other Countries in the Postal Union. Payable in Advance		40/-	22/6	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Central 6055.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE, 34, OLD BROAD STREET, LONDON, E.C.2.

OXIDE OF IRON
FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE
PURCHASED IN ANY DISTRICT.

Telegrams: "PURIFICATION, LONDON."
Telephone: LONDON WALL, 9144.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

THE BRITISH GAS PURIFYING MATERIALS CO., LTD.,
99, LONDON ROAD, LEICESTER.
Telegrams: "BRIPURIMAT, LEICESTER." Telephone: LEICESTER 5096.

Solicit enquiries for:—
NATURAL BRITISH PURIFYING MATERIAL,
NATURAL HYDRATED OXIDE OF IRON,
FIRST QUALITY DUTCH BOG ORE,
BEST QUALITY BELGIAN BOG ORE,
"PREPARED" AND "UNPREPARED" ARTIFICIAL OXIDES.

SPENT OXIDE PURCHASED.

LONDON OFFICE:
84/85, NORFOLK STREET, STRAND, W.C. 2.
Telegrams: "BRIPURIMAT ESTRAND LONDON." Telephone: CENTRAL 4545 & 4546.

GEORGE WILSON GAS METERS, Ltd.
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS.
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER,"
and at 268, Stockport Road, MANCHESTER.
Telephone: RUSHOLME 976. Telegrams: "GASMETER,"
and 46 & 47, Auckland Street, LONDON, S.E. 11.
Telephone: HOP 647. Telegrams: "GASEOUS LAMB."

WE Specialize in Small Gas-Works and Solicit Inquiries for COMPLETE WORKS EXTENSIONS, and RENEWALS.
Penney & Porter (Engineers), Ltd.,
LINCOLN.
Established 1855.
Telegrams: Porter, Lincoln. Telephones: 266 & 211.

"LUX" PURIFYING MATERIAL

THE PREMIER MATERIAL FOR GAS PURIFICATION.

THOS. DUXBURY AND CO.
SOLE AGENTS FOR
ENGLAND, SCOTLAND, IRELAND, WALES AND THE COLONIES (except CANADA).

16, DEANSGATE, MANCHESTER. *Telegrams* Darwinian, Manchester." *Tel. Nos.*: 3999 City.
PALACE CHAMBERS, WESTMINSTER, S.W.1. *Telegrams:* "Darwinian, Par, London." *Tel. No.*: 6373 Victoria.

PATENTS, Trade Marks. Inventions Advice, Handbook and Consultations free. KING'S PATENT AGENCY LTD., Director B. T. KING, C.I.M.E., Regd. Patent Agent, G.B., U.S., and Can., 146A, QUEEN VICTORIA ST., E.C. 4, and 6, QUALITY CT. (next Pat. Off.), LONDON, W.C. 40 years' refs. 'Phone Cent. 682.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815, Oldham, and 2412 Hop, London.
Telegrams—"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 243 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—ROYAL 1166.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

WEIGHBRIDGES

FOR Motor Lorries and Railway Traffic can be seen erected at our works READY FOR DELIVERY. Inspection by your Engineer invited and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.
CHARLES ROSS, LIMITED,
SHEFFIELD.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Advertisement, July 14, p. 103

J. E. C. LORD (Manchester), Ltd., Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, &c.

APPOINTMENTS, &c., VACANT.

TIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Council require the Services of a GAS ENGINEER and MANAGER. Candidates must have had Experience on the Commercial side of a Gas Undertaking, and be capable of Designing and carrying out any Extensions that may be required. Practical Experience of Vertical Retort Carbonization, Sulphate of Ammonia Plants, and Tar Dehydrating essential. Salary £350 per Annum, rising by annual increments of £25 to £450. Age 28 to 45.

Printed forms of Particulars may be obtained at my office on receipt of a stamped addressed foolscap envelope, or by personal application. Applications, accompanied by not more than three recent Testimonials, must reach me not later than first post on 23rd of August, 1926, in sealed envelope endorsed "Engineer."

Canvassing, directly or indirectly, will disqualify, but copies of applications and testimonials may, if desired, be sent to me for distribution among the members of the Council (24).

JNO. H. STOCKDALE,
Clerk.

Public Offices,
Tipton,
July 27, 1926.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
(*See "The Gas Salesman," p. 158, July 28.*)

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

THE South Metropolitan Gas Company, London, has a Vacancy for a DESIGNER in the Construction and Repair of General Gas-Works Plant. Applicant must be first-class man and have had sound Experience in Drawing Office Work.

Applications, giving Age, full Particulars of Qualifications, Experience, Military Service, and Salary required, should be made in writing not later than the 16th of August, to the EMPLOYMENT SUPERINTENDENT, SOUTH METROPOLITAN GAS COMPANY, 589, OLD KENT ROAD, S.E. 15.

WANTED — Thoroughly Qualified and Energetic MAINS SUPERINTENDENT with Experience of all Modern Methods and Capable of Managing Men.

Applications, stating Age, Qualifications, Experience, and Wages required, together with *copies* of three recent Testimonials, to reach the advertiser on or before Aug. 12, addressed No. 7681, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

REQUIRED by South Yorkshire Firm of Gas Engineers a DRAUGHTSMAN experienced in the Design of Modern Carbonizing Plant for Gas-Works.

State Age, Experience, and Salary required to No. 7677, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

GASFITTER Wanted. Must be Experienced in Iron, Compo, and Service Work, installing Geysers, Circulators, Coppers, and all up-to-date Heating, Cooking, and Lighting Appliances.

Apply, stating Age, whether Married or Single, and Wages required, to the ENGINEER AND GENERAL MANAGER, GAS WORKS, CHICHESTER, SUSSEX.

GASFITTERS Wanted. Must be Experienced Men used to Compo and Fixing Meters, Stoves, Gas Fires, &c. Wages 1s. 6d. per hour, 47-hour week.

Apply MANAGER, GAS DEPARTMENT, COVENTRY.

APPOINTMENTS, &c., WANTED.

EXPERIENCED Lecturer and DemonSTRATOR in Cooking by Gas can give Local Demonstrations for Gas Undertakings.

Gas Engineers should apply now for vacant dates to Miss H. H. TUXFORD, M.C.A., "SOUTHBOURNE," BOTTESFORD, NOTTS.

COMPANY NOTICES.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS RELATING to the ORDINARY STOCK of this Company WILL BE CLOSED on the 13th of August, 1926, and REOPENED on the 27th of August, 1926.

By order of the Board,
K. LESLIE MORTIMORE,
Secretary.

Secretary's Office,
Gas-Works, Clarendon Road,
Hornsey, N. 8,
Aug. 2, 1926.